*Spring Overhauling—Engines*

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# MOTOR AGE

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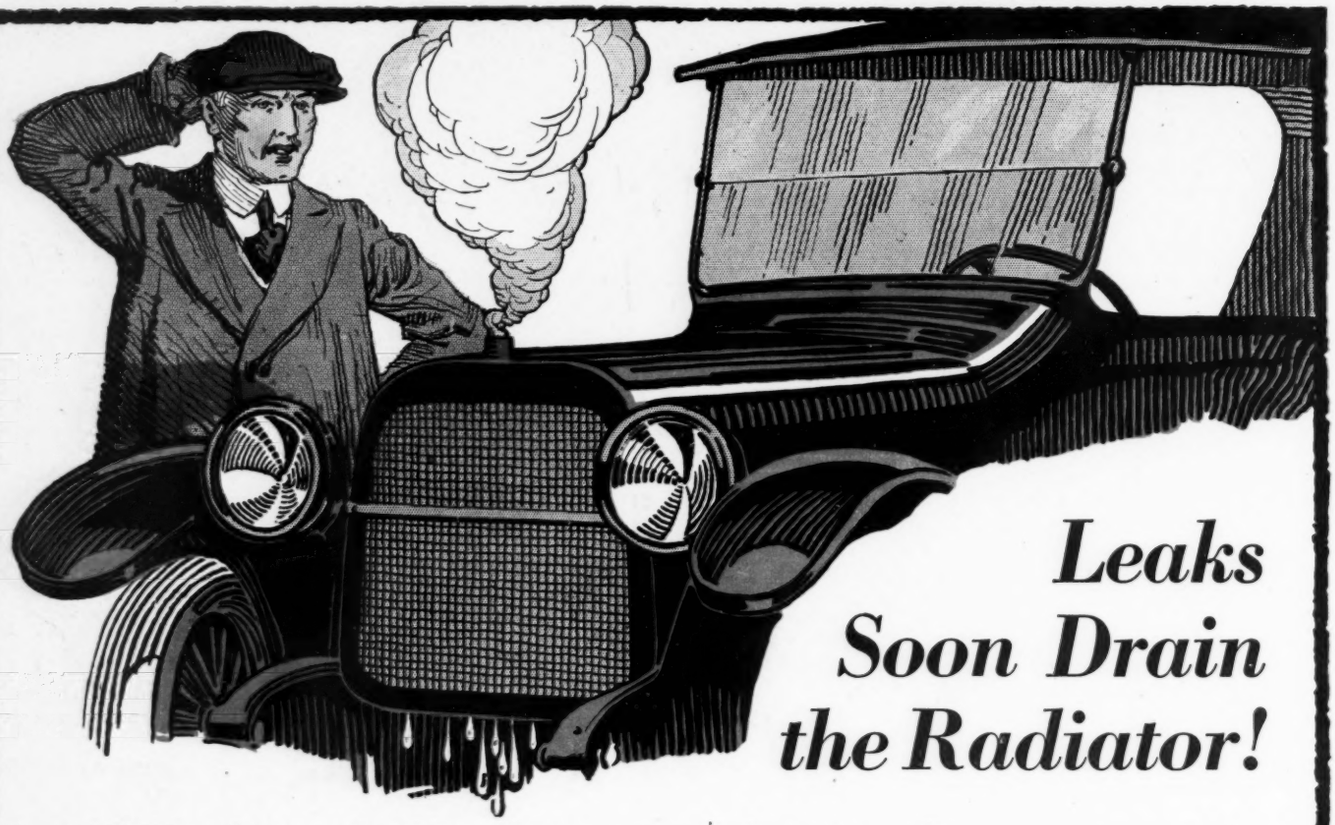

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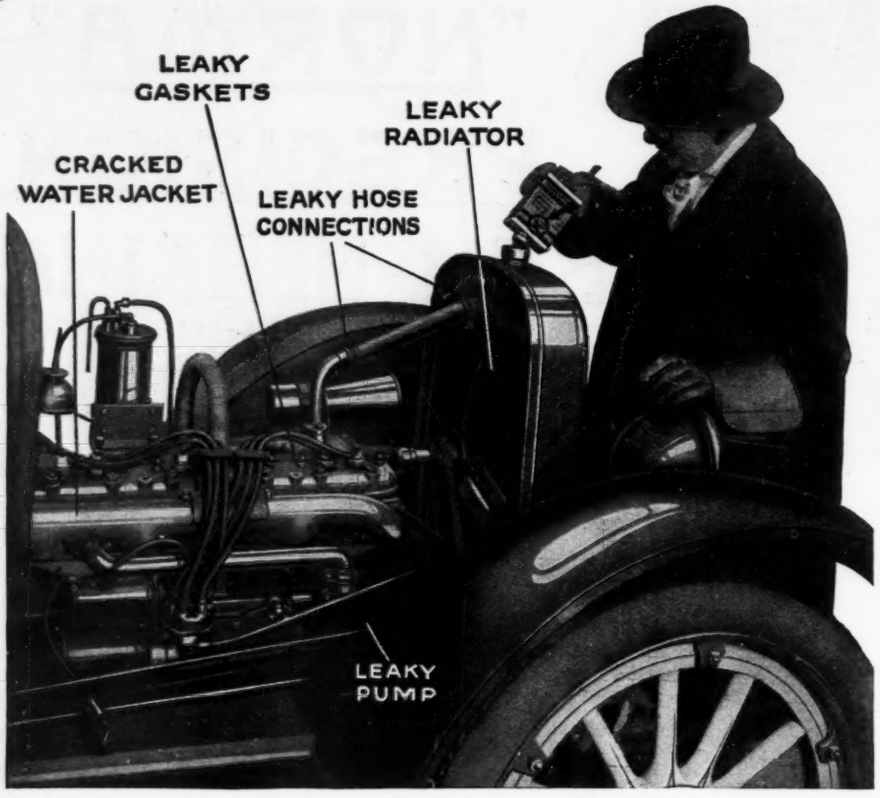


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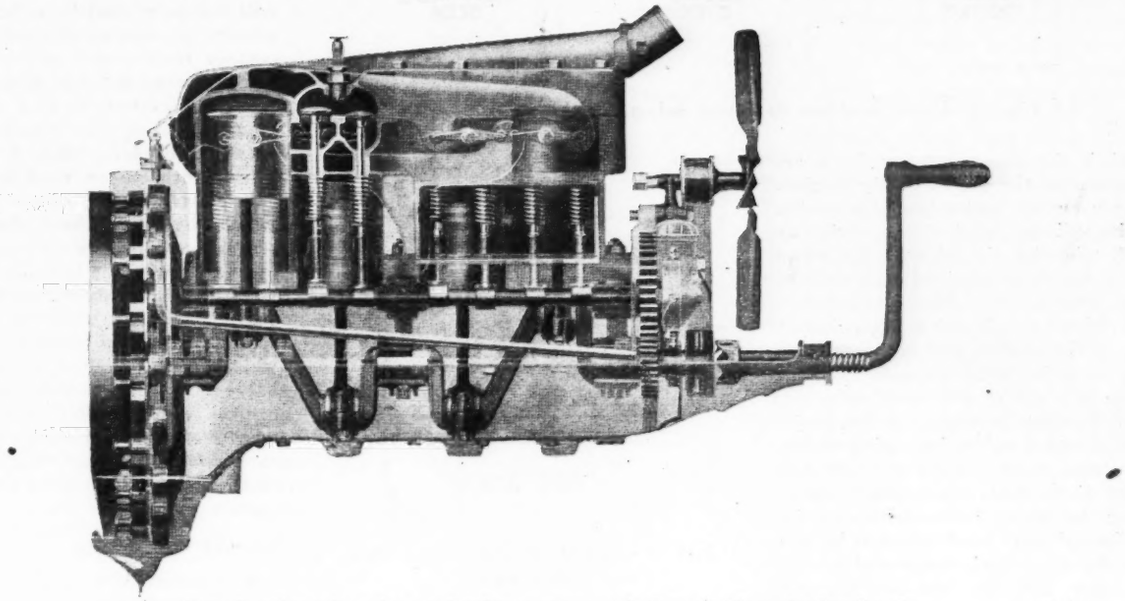


Fig. 1—Complete four-cylinder engine with detachable cylinder head

# *Spring Overhauling—Engines*

**Many owners make an annual practice of turning over their cars to the service station or repairmen for a thorough going over, in preparation for the summer driving—more of them should. Next week MOTOR AGE will suggest methods of selling the spring overhauling idea to the owners—this week are taken up some of the features of overhauling and repairing the engine. Other parts of the car will be considered in a similar way later.—EDITOR.**

**In Two Parts—Part I**

By T. P. Bowman

TO be told that merely adjustment of bearings are necessary in an engine, carbon must be removed, or that new rings are necessary may be sufficient so far as an order is concerned, but for the mechanic to know why and what brings about certain conditions which makes repairing necessary is of the utmost importance.

Take a conventional four-cylinder engine as a working model. The principal of the six, eight or twelve is identical but with the four we have fewer cylinders to deal with and a thorough working knowledge of the four enables the repairman to understand and repair any of the multi-cylinder engines.

Fig. 1 represents a complete four-cylinder engine, one which is, in principle, practically the same as every four-cylinder engine manufactured to-day. We know this engine will run if gasoline flows into the carbureter and is exploded in the cylinder by a spark from the ignition system. Turning the flywheel to the left, as when cranking the engine from the front, at every half revolution of the flywheel we notice a certain resistance—compression. The principle of compression is much the same as that of a common tire pump. When the handle is pulled up, the plunge draws the cylinder full of air. If we close the end of the hose, air will not escape as the handle of the pump is pressed downward; consequently the air is compressed, acting the same as air drawn into the engine cylinder.

In the case of the engine cylinder, gas is drawn in instead of air, but the action is the same. In two complete revolutions of the flywheel, compression occurs four times. This differs from the tire pump, which compresses air each time the plunger is pressed down.

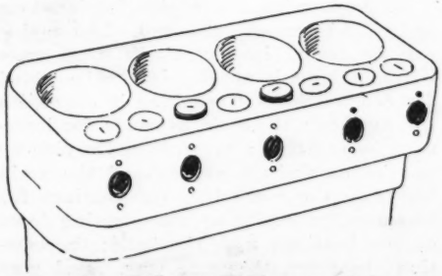
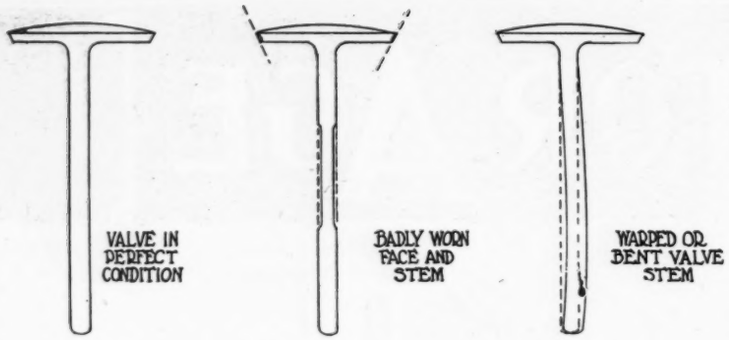


Fig. 2—Cylinder head removed from engine, showing valves

To make this more clear, remove three of the spark plugs so compression can be obtained in only one of the cylinders. Revolve the crankshaft until compression has occurred and revolve it until compression occurs the second time, at the same time noting the number of complete revolutions necessary to bring about compression. Two complete revolutions are necessary. Now taking the tire pump, with the hose open, raise the plunger. This constitutes the suction stroke, because air is sucked into the cylinder. Close the hose so the air cannot escape and press down on the plunger. This stroke compresses the air. Releasing the downward pressure on the plunger permits the plunger to rise to the top of the cylinder without any assistance except for the expansion of the compressed air forcing it to the top. This stroke constitutes the power stroke. Releasing the stoppage of air at the outlet of the air hose and pressing down the plunger forces the air out of the cylinder and constitutes the scavenging, or exhaust, stroke.

Thus four strokes are necessary to complete the operation—suction, compression, power and exhaust. From this the term four-stroke cycle, generally called four-




Figs. 3, 4 and 5—How to detect defects in the valve

cycle. With the tire pump, we have actually duplicated the action of the engine, but to more clearly understand the action remove the cylinder head of the engine as in Fig. 2, whereby the pistons, cylinders and valves are fully exposed and we can see their movements. For convenience, mark the pistons 1, 2, 3 and 4, beginning at the front of the engine, and also mark the valves 1 to 8 in their respective order. There are two valves for each cylinder, Nos. 1 and 2 valves belonging to No. 1 cylinder, Nos. 3 and 4 valves belonging to No. 2 cylinder, and so on. Each cylinder has one intake valve and one exhaust valve. Examining the valve ports which are the holes in the cylinder block covered by the valves we find that the hole covered by No. 1 valve leads directly into the exhaust manifold and the hole covered by No. 2 valve leads directly into the intake manifold; therefore these holes, or ports, are termed exhaust port and intake port, and the valves which cover them are termed exhaust valve and intake valve.

**Operation of Engine**

While you have removed the cylinder head, imagine it is still on the cylinder block. When the cylinder head is on the block no air or gas can taken into the cylinders or forced out of the cylinders unless either the intake or exhaust valve, is open. Revolve the flywheel until No. 1 valve, the exhaust valve, has opened and is just about to close. No. 1 piston comes very close to top dead center. Proceed slowly with the revolving process, and the piston will be found to reach top dead center at about the same instant the exhaust valve closes. Stop for a moment, because this will be the starting point. As the flywheel is slowly revolved the piston will be seen to begin on its downward travel and at practically the same time the exhaust valve, No. 2, will begin to open. Treating the piston as a plunger, gas will be sucked into the cylinder, because there is an opening in the cylinder which in this case is the intake valve. Continuing the operation of revolving the flywheel it will be noticed that when the piston has reached the bottom, lower dead center, and is just beginning on its upward stroke the intake valve has closed. Now both valves are closed and as the upward stroke of the piston continues there is no way for the gas to escape, it is very plain the gas must be compressed when the piston reaches top dead center. It is at this point ignition takes place. At this point the exploded gas expands, and as there is no outlet for it to pass through it drives the piston downward. As the piston approaches lower dead center on the power stroke the exhaust valve opens, thereby relieving the cylinder. From this point on until the piston again reaches top dead center it forces the exploded gas out of the cylinder. This point is the end of the cycle.

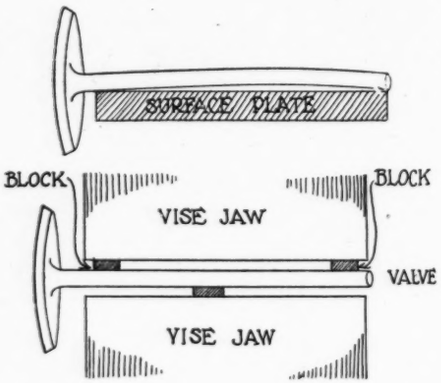



Fig. 6—How to straighten bent valve stem

If the engine in operating does not properly do each of the several things it is supposed to do, it will not function and is in line for repairing. If the engine will complete its cycle of operation perfectly, the engine is in perfect condition so far as the principles of operation are concerned, but the performance of the engine depends entirely upon two other things, carburetion and ignition. These will not be discussed under engine overhauling and repairing but are mentioned because even though the engine is in perfect condition it is possible for it to perform poorly on account of defects in either of the two. Throughout the work of engine overhauling assume that the carbureter and ignition system are in perfect order.

Suppose an engine has been delivered with instructions to thoroughly overhaul or rebuild, if necessary, to make a first-class job.

To begin with, the engine is placed on or bolted to an engine stand. The engine can be tested in several different ways before taking it apart. It can be tested for compression by cranking it over with the flywheel; the main bearings for looseness, by exerting a pressure and prying up on the crankshaft at each of the main bearings; the connecting rod bearings for looseness, by lifting up and pressing down on the bearings with the hand; the camshaft bearings, the same way. End play can be detected in the crankshaft by forcing the crankshaft backward and forward in the main bearings. Backlash or play in the timing gears can be tested by working the camshaft gear to and fro against the crank gear. Overhauling necessitates complete tearing down of the engine and testing every part.

The engine shown being of the removable-head type, the cylinder head will be the first part to be removed. After removing all the carbon from the combustion chamber of the head lay it away where it will not be nicked by other metals. With a knife or some convenient form of carbon scraper remove the carbon from the tops of the pistons and with a light center punch mark the pistons 1, 2, 3 and 4 from the front of the engine. Clean the tops of the valves and mark them 1 to 7 inclusive. The eighth valve need not be marked. When marking the valves with the center punch the valve should be resting in its seat, otherwise it is very apt to be sprung by the blow of the hammer.

After the valves are marked, remove the valve doors and with the aid of a valve spring compressor remove the keys or locks which hold the valve springs in place on the valve stem. The valves and springs now can be removed. Before laying the valves away clean them thoroughly. Remove any carbon which may be remaining on the top of the cylinder block. This completes the carbon removal.

**Remove the Pistons**

The engine is now tipped up-side down and the pistons and connecting rods removed. Look for a number on the side of the connecting rod cap and a corresponding number on the same side of the rod. Some rods and caps are factory-marked, 1, 2, 3, and 4, corresponding to the cylinders in which they are placed. The numbers generally appear on the camshaft side of the connecting rod, that is, the side of the rod nearest the camshaft. However, if they are numbered, they should be replaced in the same position as they were before removing. If they are not numbered, it is well to punch-mark them on the camshaft side, because if a practice is made of placing all markings on the camshaft side it will become a habit to replace the parts that way and there is less likelihood of making a mistake in assembling.

Remove the connecting rod caps and let the pistons slip down and out the cylinders. Replace the connecting rod cap on its rod as each piston is removed and carefully set them out of the way. Next inspect the crankshaft bearing caps for marks as to their relative positions. If they are not marked, mark them on the camshaft side and proceed to remove them. At this time it is well to examine the timing gears for backlash or lost motion by holding one of the gears solid while the other one is worked back and forth. If the backlash is very great, bear it in mind as the work progresses. Remove the crankshaft and set it away. The camshaft with its bearings are to be removed next, and the push-rods or tappets follow.

The engine now is completely disassembled and ready for inspection. You now must know what is right and what is wrong with this or that part, and unless you do know you have no assurance the job will be any better after reassembling.

Examine the valves. Fig. 3 shows a

valve in perfect condition. Fig. 4 shows the valve face badly worn and the valve stem considerably the worse for wear. Fig. 5 shows a warped or bent valve stem. It is doubtful if a valve removed from an engine which has seen considerable service will be in perfect condition. But the valve is in good condition if regrinding will restore it to its original usefulness. A bent valve stem can be straightened by locating the angle of the bend and applying pressure at that point. Fig. 6 shows how this is done with a surface plate and vise with blocks. The valve stem should be turned on the surface plate after each attempt at straightening. A valve which shows no other defect than that of a bent stem may be used provided refacing and regrinding will restore it. Discard the valve worn at the stem. It is beyond repair.

The question comes up as to why the valves require attention and the effect certain defects of the valve have upon the operation of the engine. Begin with compression. Gas taken in on the suction stroke of the engine and on the following stroke, which is the upward stroke, is compressed and ignited when the piston has reached upper dead center, and at this point the piston is forced downward constituting the power stroke. Knowing that the amount of power obtained from the explosion depends upon the amount of the gas exploded, if full power from the gas drawn into the cylinder is to be obtained, none of that gas should be permitted to escape before it is exploded. Assuming other parts of the engine are in perfect condition, the gas could not escape after once sucked into the cylinders if the valves were gas tight when closed. When a valve is spoken of as seating properly it means every part of the valve face makes a perfect contact with every part of the valve seat. Unless a valve seats properly there will be one or several portions of the valve face which do not touch the valve seat, and this will have the same effect in regard to the compression of the cylinder as a slight crack in a high-pressure air tank. It will leak. So will the valve leak, and the gas which is drawn into the cylinder passes away when it is compressed. The result is a certain amount of power is lost because a certain amount of the gas has been lost.

### Warped Valve Head

A warped valve head leaks because it sets improperly. A valve which is pitted because of the intense heat of the explosion leaks. A bent valve stem may cause leakage also. See figures 4 and 5.

Before proceeding with the repair of valves inspect the valve stem guides in the cylinder block. Worm valve guides affect the suction stroke. When the piston travels downward with the intake valve opened, it draws in gas. The purpose of the intake valve is to open the passageway between the cylinder and the carbureter and permit the intake of gas. Air or anything else must not enter the cylinder except that drawn in through the intake manifold. This means that if the carbureter were detached from the intake manifold and the manifold were sealed air-tight at that point, the cylinder would produce a vacuum on the suction stroke just as would be the case with the tire pump if the finger were placed over the hose when the plunger was raised. We can readily see if air were permitted to enter the cylinder on the suction stroke in this test, a vacuum would not be produced. If the spark plug is removed we know a vacuum could not be produced.

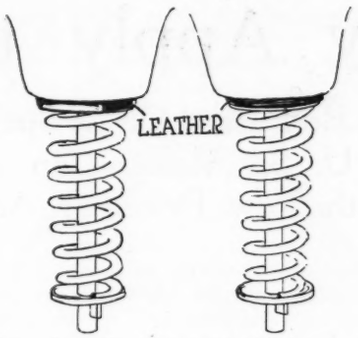



Fig. 7—To overcome leakage of guide for a time

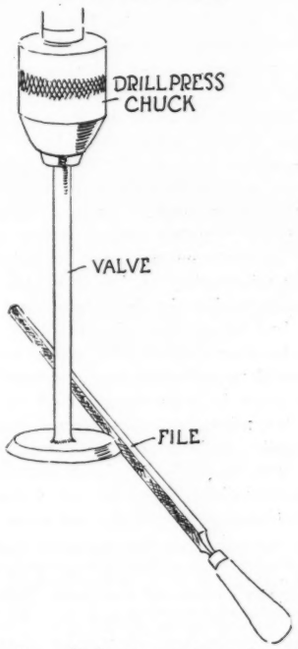



Fig. 8 — Refacing valves by drill press and file

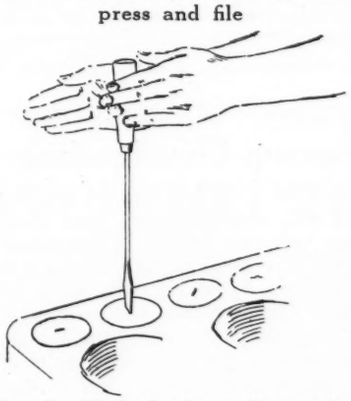


Fig. 9—Method of grinding valves by hand

Study the fit and operation of the intake valve in its guide. With the intake manifold still sealed, execute a suction stroke. The intake valve opens in this operation, and the valve could just as well be removed during the time it remains open because it has no use except to close the intake passage way and keep it closed at all other times. Remove the valve and attempt to obtain a vacuum. As the piston goes down, air enters the chamber. The cylinder head is tight and the intake manifold is sealed, so there is only one place to trace this leakage and that is between the cylinder and the intake manifold.

A hole leads from the outside directly into the intake port, and it is through this hole that air enters the cylinder. This hole must be plugged up to prevent leakage. The valve stem does this, but the extent it does depends on how well the stem fits into this hole, which is called the valve stem guide. The valve stem must fit freely enough to permit air to pass up between the stem and guide and then into the cylinder, which will tend to change the mixture of the gas after it has left the carbureter. From this we realize the importance of a perfect fit of the valve stem and guide and also the result of a worn stem or guide. The clearance between the two should be about 0.0015 in., which is just enough play to give free and easy action without binding.

To test this clearance, clean the stem and guide thoroughly with kerosene and place the valve in its guide. Then, with the fingers, try to work the valve from one side to the other. If found to have nearly $\frac{1}{64}$ in. or more play, the valve should not be used. Try a new valve which has a perfect stem and see if this will reduce the play. If it does, the new valve may be used and the guide need not be repaired. If it does not, a valve with a stem of sufficient oversize must be used. It may be hard to obtain the exact oversize, especially if more than one valve is to be replaced, because the wear of the different guides vary and the stem of a certain oversize may not fit each one perfectly. Where equipment permits, it is proper to procure a valve which has a stem of a slightly larger diameter than that of the guide. The guide then is reamed to the size which will permit a close and easily working fit. When this cannot be done the leakage of the guide may temporarily be overcome with such an arrangement as in Fig. 7.

### For Pitted Valve Face

To overcome the deeply grooved or badly pitted valve face, several very good refacing tools are on the market, and besides doing a very satisfactory job they are considerable of a time saver. If not available, the valve may be refaced by the drill press and file, Fig. 8. The valve seat which is in, and a part of the cylinder block, can be repaired only with a special tool, and a first-class job cannot be turned out without reseating the valve port. Grinding the valves in their respective seats is the next operation. This is not a task of much difficulty. There are several very good mechanical valve grinders, but when a tool of this kind is not to be had, the hand operation, which is not so speedy, can be executed to perfection. A coil spring of sufficient diameter to slip over the valve stem and of just enough tension to raise the valve ¼ in. from its seat is necessary whether the job is done mechanically or by hand.

The heads of some valves are slotted so an ordinary screwdriver can be used as a tool, and some are constructed with two small recesses especially drilled in the head for the admission of a forked tool.

*(Concluded next week)*

# How Tax May Apply to Accessories

## Should Not Be Passed On as Such—Recent Ruling by U. S.—Maker Can Absorb It, Include With New Price, or Add to Old

CHICAGO, March 17—Dealers who have been in doubt as to the best policy to pursue in adding the new revenue tax to motor car accessories should find their uncertainties set at rest by the recent ruling of the Federal authorities that the amount of the tax should not be passed on to the consumer as a tax. The same applies to the jobber in billing the dealer.

The manufacturer may do any one of three things. He must pay the Government a tax on accessories, amounting to 5 per cent of the average price at which he sells to the dealer or jobber. He can pay this tax without passing it on to the jobber, in which case he really absorbs it. Second, he can pay the tax and add the amount of the tax as the new selling price to the jobber or dealer, or he can pay the tax, bill the jobber or dealer at the old price and add an item for revenue tax. In the second case the manufacturer may be said to have absorbed the tax, but he passes it on just the same.

**Makers Pass Tax On**

Incomplete returns of a census of the accessory manufacturers by the Automotive Equipment Association, formerly the National Association of Automobile Accessory Jobbers, seems to show that very few of the manufacturers are absorbing the tax either actually or by an increase of the list price. Most of them are passing the tax on to the jobber as a tax item.

The jobbers in turn will have to pass the tax on to the dealer but the jobbers must not bill it as a separate item. They are expected to change their selling prices to take care of the tax. Naturally, the dealer should do likewise. He should not add a tax on his own hook because the tax has been taken care of in the price before it comes to him.

The fact that the same articles very frequently may be sold either for motor cars or for other purposes has complicated the tax situation considerably. Take, for instance, the common tools familiarly known as "auto pliers." Thousands of them are sold by hardware dealers for other purposes than motor car work and in such cases would not be subject to the tax. If they were sold for use on a car they would carry 5 per cent tax; on a truck, 3 per cent; on a motorcycle, 5 per cent, and on a tractor, nothing. There is nothing except his own honesty to prevent a dealer in general supplies from ordering these as "combination pliers" for a general stock and transferring them to his motor car department. Thus he would buy them without the tax and could undersell regular dealers in car accessories who had to pay the tax on the same article.

The Government expects the manufacturer to watch out for its interests and see that all goods of this type going to the motor industry carry the tax. Many manufacturers are uncertain as to what course to pursue in specific instances, and some are afraid of getting into trouble unwittingly by letting goods go tax free which later are consumed in taxable markets.

Tools put up in special kits for cars probably would be considered taxable, whereas the same tools sold separately through general supply houses might go tax free. Cotter pins, for instance, are sold by one manufacturer in bulk tax free but the same article when sold in a special package which goes to the motor trade carries 5 per cent, although there is no doubt but what a large proportion of them go into the truck or tractor trade, which carries less tax or none as the case may be.

On the whole, the entire situation as regards accessories is in something of a muddle, but where there is no intent on the part of the manufacturer or jobber to evade the law and no attempt to get motor goods tax free there is little chance that such will happen by mistake. Additional forecasts of probable rulings on features of the revenue act have been given by the National Automobile Chamber of Commerce. Some of these of direct interest are:

Under the new law the taxpayer who sells both at wholesale and retail may estimate the tax on the retail sales of his customary wholesale price, the customary wholesale price being his highest usual wholesale price, or the wholesale price bearing the least discount.

The most troublesome provision of the new law is the tax on tires, inner tubes, parts and accessories. The Revenue Bureau is having considerable difficulty in getting an exact and workable definition of parts and accessories. It probably will rule that substantially complete manufactured articles of commerce which form parts or components of a complete car or which are attached to or used with a car are taxable parts and accessories, provided they are intended primarily for such use. This would mean that sheet metal, lumber, leather, wire and the like would be "material" and not taxable. Also that incompletely manufactured articles, such as forgings for crankshafts, blanks for gears and the like, would not be taxable. Likewise completely manufactured articles, such as ordinary bolts, rivets, screwdrivers, wrenches and the like, would not be taxable because they are not primarily intended for the car but have many other uses.

Spark plugs probably will be considered taxable. The ruling on ball bearings is debatable.

Whatever may be the proper definition of parts and accessories, another troublesome point is that sales of such parts and accessories as well as tires to car manufacturers are exempt from tax. The Revenue Bureau probably will rule that the sale of such articles by their makers to car manufacturers who intend to embody them in their product will be exempt but that any excess purchased to replace defective parts or to sell to car users to replace worn-out articles would be subject to the tax, with the right of the taxpayer to obtain a refund or credit of taxes if it can be demonstrated that the articles were either given in replacement or were embodied in the complete car by the factory. Parts or accessories which usually are charged for pending settlement of the question as to whether they should be free replacement parts are tax free but of course are treated as a taxable sale if, and when, it is found that the returned part is not defective. It is advisable to make shipment of such replacement on memorandum.

### Spring Overhauling

**MOTOR AGE has made a practice each year of helping bring about more efficient spring overhauling. Along with this standard service it is publishing, beginning this week, an article for the dealer and garageman on overhauling and repairing the engine, one of the most vital parts of the spring overhauling. But for the dealer and garageman there is more than the actual work of overhauling to be done. The dealer and garageman should prepare now to cash in on its facilities for giving cars spring overhauling.**

**It is for this purpose that MOTOR AGE for next week will offer ways and means whereby the dealer or garageman can attract business of this nature to his establishment. This article on CASHING IN ON SPRING OVERHAULING is designed with the sole end in view of helping dealers and garagemen sell their service in this line. You cannot afford to miss it.**

### ACCESSORY JOBBERS MEET

New York, March 14—Supplementing a resolution passed by the local accessory jobbers here March 10, in which it was suggested that the accessory manufacturers absorb the 5 per cent tax and that he make his returns direct to the Government, the following resolution has been passed:

Resolved, That the jobbers of the metropolitan district recommend that the manufacturers of motor car accessories absorb the 5 per cent Federal excise tax and, if necessary, revise the selling schedule to enable the jobber and dealer to resell goods without any mention of the tax.

At the meeting an open discussion was held at which some sixty representatives of accessory manufacturers were present. Several decided to absorb the tax without changing the prices. Others decided to absorb the tax and revise the selling schedules by increasing the prices. Another decision was to the effect that the 5 per cent tax would be simply added to the invoices as a tax.

The following jobbers were present and in favor of the resolution: Auto Supply Co., Beckley-Ralston Co., Julius Bindrim, Economy Auto Supply Co., Farrell Auto Supply Co., King Tire Co., Lowe Motor Supplies Co., Martin Evans Co., Motor Car Equipment Co., Oriental Rubber & Supply Co., A. J. Picard & Co., Inc., W. E. Pruden Hardware Co., Ready Auto Supply Co., and the Whittemore-Sim Co.

### MOTOR TRANSPORT DAY

Macon, Ga., March 15—Macon is planning a motor transport demonstration for April 3. It is to be the first general show of its kind in this territory and is the result

of a determination by the Macon chamber of commerce to encourage highway transport. The demonstration is to include all types of trucks, and outside dealers are to be allowed to enter. No truck may rate over 3½ tons or be loaded in excess of the rated capacity.

It is planned to assemble the trucks on the evening of April 2 for a parade headed by the governor of Georgia, mayors of Macon and of the several cities to which the trucks will be run April 3. Three truck trains will be run to Fort Valley, Barnesville and Monticello, stopping at intermediate points to load and unload traffic. The freight will be carried free of charge, one train traversing the largest peach orchard in the world and the others prosperous farming sections.

### UNSOLD TRACTOR REPAIRS

Des Moines, Iowa, March 14—Special concessions on tractor repair parts, in the way of extra discounts and return privileges on unsold parts, are being made by the Emerson-Brantingham Implement Co. as an inducement to its dealers to stock and carry an adequate supply of tractor spares. The company gives 15 per cent discount on parts regularly. An additional 10 per cent is offered the dealer who will stock spares according to the following schedule:

Spares to the value of $150 on all contracts for six tractors or less.

Spares to the value of $300 on all contracts for six tractors up to twenty-five.

At the end of the contract year the company will take back all unsold parts and will replace them with parts to an equal value for the ensuing year. The provision insures the dealer against the danger of accumulating a stock of obsolete parts and assures him that always his stock of spares shall be current.

The company furnishes the dealer, upon request, with suggestions as to the extent and assortment of spares he should have considering the number and character of the tractors there may in his territory.

This plan is a considerable advance over the methods which have been commonly in vogue in the tractor trade.

Durant, winner at Santa Monica

### TRAFFIC MEN TO MEET

New York, March 14—The National Highway Traffic Association will meet at the Automobile Club of America March 21, at 8 p. m. The program includes talks by Francis M. Hugo, secretary of state, Dr. Shirley W. Wayne, assistant registrar of records, department of health, New York, and Elmer Thompson, secretary of the Automobile Club of America.

The report of the committee on general highway traffic regulations for drivers with directions for pedestrians will be presented by William P. Eno, chairman, who is also chairman of the Highways Transport Committee.

# Durant Wins Santa Monica at 81.28 M. P. H.

SANTA MONICA, Cal., March 15—Special telegram—Durant, driving a Chevrolet special, won the Santa Monica road race to-day at a speed of 81.28 m.p.h. for the entire distance of 250.24 miles. Durant took the lead at the start and was never headed. Eddie Hearne in another Chevrolet was second, Lecocq was third and Pullen fourth.

Two accidents resulting in one fatality marred the event. Both accidents seemingly were caused by lack of practice. Walter Melcher, who was substituted for Christensen as driver of the Hudson special just before the start, was killed. Melcher was a San Francisco youth and was the last of the seventeen starters to get away. In his very first lap he failed to make the Soldier's Home turn, notorious for its toll of death and disaster. The car headed straight up a small embankment, struck the streetcar rail, plunged 20 ft. into the air, turned around twice, collided with a pole and rolled over. Melcher died within an hour but his mechanic, Eldridge, was thrown clear of the car and escaped unhurt.

Two days of constant rain preceeding the race had prevented practice and Melcher had driven the course only in a touring car previous to the start. Another accident caused by lack of practice was that of Roscoe Sarles driving the Roamer special. He had delayed practice until prevented by the rain, so he started without any preliminary practice at all. On his second lap he overran one of the right-angle turns, went through a wire fence, over a pile of sand bags and wrecked his car.

The revival of the Santa Monica to-day was the first event on the famous course since 1916. It was conducted by the Los Angeles Motor Car Dealers' Association as one of a series of events to stimulate interest in motoring. The course is 7.36 miles long, requiring thirty-four laps for the distance of 250 miles. Durant, Hearne, Lecocq and Pullen split the purse of $9,000.

Clear skies and warm sunshine after two days of constant rain brought out 75,000 persons. As a curtain raiser Ralph de Palma in his record-breaking Packard drove an exhibition lap at an average speed of 93.4 m.p.h. De Palma, who made better time than his exhibition lap in practice, said the course was so rough in places it was like aviating on the ground.

Of the seventeen entries in the main event of the day only fourteen cars started. Trouble for the drivers began early when Krueger went out in the first lap with a broken valve. In the second Pullen's car had spark plug trouble and he dropped from fourth to last place. Cooper and Brown also changed spark plugs. In the eleventh lap Cooper was eliminated by a broken valve. A broken oil line put Thomas out in the fourteenth round. Toft went lap after lap with a frozen clutch and could not stop.

In his seventh lap Pullen's car caught on fire, but he extinguished the blaze and continued. Durant drove a special racing car bearing the name of Chevrolet. His average of 81.28 m.p.h. is remarkably fast under the conditions. He was the first to start and never was headed, although making two stops at the pits to change tires. He set a pace so hot none dared to meet it. From the end of the first five laps to the finish his average was better than 81 m.p.h.

Hearne, in a duplicate car, starting second, went through the entire race without a stop, although on the last several laps only three cylinders were functioning. Lecocq's work was a surprise. He started third and held that position in all but six laps. The driving of Pullen was the most spectacular of the day. He pushed the car for all it was worth all the time. An unusual feature about the race was that the cars starting one, two, three and four finished in that order.

## Indianapolis Entries

CHICAGO, March 17—Seven entries have been made thus far in the 500-mile race to be staged at Indianapolis May 31. They are:

| DRIVER— | CAR— |
|---|---|
| Durant | Chevrolet |
| Mulford | Frontenac |
| Brown | Hudson |
| Christiaens | Sunbeam |
| Chassagne | Sunbeam |
| Goux | Peugeot |
| Cooper | Stutz |

In addition, MOTOR AGE is advised by its European correspondent, W. F. Bradley, that Rene Thomas, winner of the 1914 race at Indianapolis; Albert Guyot, who finished third in the same event, and Jules Bablot will drive French cars at Indianapolis May 31. Bablot will make his bow to the American racing public in that case, although he is an old-time driver, having competed in the Gordon-Bennett races for Brasier and put up some spectacular fights against Mercedes when he was on the Delage team. Bablot, in fact, is looked on as the most spectacular and daredevil driver in France. He is unacquainted with American tracks but has had experience on Brooklands.

# EDITORIAL

## Racing and Preliminary Practice

IT is unfortunate that the first race of consequence of the season has been marred by the death of one of the contestants through an accident which, judging from the reports of Saturday's event at Santa Monica, was due to lack of wisdom on the part of some official or officials. Both the fatal accident and another one which resulted, fortunately, in no fatalities occurred in the case of drivers who, on account of weather conditions, did not get in any practice.

THE race officials were not responsible for the two days of rain which preceded the race, and we understand their desire to give the entrants a chance, but if rain prevented the drivers from getting sufficient practice, those in charge took too great a chance in permitting them to start. It is a wise rule of the A. A. A. that requires drivers to satisfy officials as to their ability on the track, and one whose observance seems particularly called for on a course requiring as thorough experience and as great skill at the wheel as does Santa Monica.

THAT Santa Monica was promoted by the dealers of Los Angeles "To further the motor car trade" makes the one slip all the more regretable since other dealers' associations are considering similar events for the same purpose.

## Tractor Morale

THE British Motor Transport had a high morale among its drivers on the Flanders front. The convoy of trucks, clean, spick and span, well painted, with good cabs for the drivers, with good rain aprons, moved along as majestically as a limited train pulls out of Chicago for Denver. The drivers were well uniformed, clean-shaven and happy. They were as proud of their trucks as the pilot of his chassee plane. The truck was as much to the driver as the well polished 77 mm. gun was to the gunner. The truck driver was proud of his machine, proud of his job and proud of the link he constituted in the military organization. Let us apply this to farm tractors:

THE tractor should be kept clean. It should be kept spick and span. It should be kept in good repair. It does anyone good to have his clothes pressed. You have a new thrill in life when you step out with a well-groomed suit. It may be five years old but there is new magic in those ridges that stand out and give shape to the trousers. It helps your spirits to get your shoes cleaned. What a mental stimulant there is in a haircut. The soldier was compelled to shave every morning because it was the greatest builder of morale in the entire army. A soldier is a better man after a shave. He is more alert mentally.

THE tractor operator is human. He is subject to the same likes and dislikes. He is a creature of the same moods and joys. A dirty tractor depresses. A clean tractor inspires. We do not expect the tractor to be garaged every night and treated to a wash and polish, but it should not be entirely forgotten. When a job is done the tractor should be cleaned up and housed. There should always be in the toolbox some good rags to clean off the grease and rub up occasionally a few of the brass or polished parts.

EVERY bright and polished spot on the tractor is a silent voice asking for better maintenance. It is a reminder that other parts must be looked after. It tells of oil cups to be looked after, grease cups to be turned down, oil supplies to be kept in mind, spark plugs to be cleaned and a general scrutiny to be kept up. Keep the bright spots polished and keep the tractor young.

## "Never Put off Until Tomorrow—"

NEVER put off until to-morrow what you can do to-day. This applies to roads as well as to anything else that calls for action. If the United States is to have good roads, year-round roads, roads that will bear up under highway transport, which means motor trucks principally, to-day is the day to begin building them, not to-morrow. Congress has passed the $209,000,000 appropriation for highways. It is up to the states, the communities, to get busy and take advantage of this opportunity. This takes in the dealers of the country also. For it is to the interest of the dealer that the country have good roads. Without good roads the sale of cars is limited. Without good roads the sale of trucks is limited. Without good roads the farmer cannot get to market the increased produce he raises with the use of the tractor.

THEREFORE, good roads is the dealer's job. It is the job of the automotive dealer or the dealer in any one or more of the automotive lines. If there is a bond issue at stake in your county, your state, get your shoulder to the wheel. Do as the dealers did in Illinois. Use your dealer organization, your show windows and your personal efforts to put the road issues across.

JUST now there is being formed a Federal Highway Council to work for the mobilization of Federal resources and control for highway construction and for the crystallization of public opinion for the three projects approved at the Chicago highway congress last December, namely:

1—Creation of a Federal Highway Commission to control highway construction and development.
2—Federal financial aid to state highway construction.
3—All Governmental control of highways to be under the Federal Highway Commission.

IF your trade organization is doing nothing in the way of road work, see that it does something. If the roads in your county are a disgrace to humanity, you can help make them an honor. In what shape for spring are your roads? Do you think your prospects will be willing to take the new cars they buy from you out on them? Are you willing for the car you sell to be tried out by a brand new owner over ruts and corrugated highways, thus having the owner judge of its riding ease and so on from such unfavorable conditions. You as a dealer have as much influence in your community as any other. Use it for roads.

# Fords Return Home and Start Work on New Car

DETROIT, March 15—When Henry Ford and his son, Edsel, returned to Detroit this week he immediately started work on plans for his new car which he hopes to sell at $250 or $300. How long he will continue this work is problematical for it is said attorneys representing the minority stockholders of the Ford Motor Co., are preparing to serve an injunction, stopping further work and bringing the whole affair into court.

Mr. Ford has corroborated all statements made by himself or his son in Los Angeles and Kansas City regarding his new enterprise and given in MOTOR AGE last week. He added a few more unpublished facts and discussed his new car.

Edsel Ford will not resign as president of the Ford Motor Co. He will remain to protect the Ford interests. The Fords propose a factory organization five times that of the present Ford Motor Co., with, when in full operation, more than 200,000 on the new Ford payroll. One of the big plants probably will be located in Detroit.

"The present Ford engine, model T, was designed twelve years ago," said Mr. Ford. "Nothing of the old car will be used in the new. It will have an entire new motor and new features. It will be just what the public wants. It is impossible for me to give you the exact details of the new car yet. Model T took two years and four months to perfect so you see it may possibly take me a year before I have my new plan completely worked out."

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### SAXON MAY REORGANIZE

Detroit, March 15—A special meeting of the stockholders of the Saxon Motor Car Corp. will be called soon to allow them to vote on a plan for clearing up the company's indebtedness, either through an assessment or through a reorganization. Plans for the financing of this company have been completed by a creditors' committee composed of Detroit and Chicago bankers.

Under one plan to be submitted the stockholders will be asked to vote on an assessment against them for the full amount of the indebtedness of the company. Under the second plan a complete reorganization will be asked which would virtually wipe out the $6,000,000 stock of the company.

It is proposed under the second plan to issue $2,000,000 in bonds, $1,250,000 preferred stock and $3,200,000 in common stock. The creditors feel confident of the future of the company under the plan and are willing to take common stock in return for their obligations at par, provided they are given option on the remaining common stock. Claims against the company total $2,400,000. The creditors, therefore, will obtain an option on $800,000 common stock, and preferred stock would be purchased by a banking syndicate and offered to the public.

Here are four representative Indianapolis showrooms as they appeared during the opening week which, for lack of a suitable building, took the place of a show. From top to bottom they are E. W. Steinhart Co., Cadillac and Dodge Brothers distributer; Sterling Motor Car Co.; Marmon and Buck

# Omaha Breaks All Its Show Records

## Daily Average of 20,000—Farmers and 3,500 Dealers Attend Exhibition

OMAHA, Neb., March 15—Omaha's fourteenth annual show closed its week of exhibition here tonight, with evidence in plenty that every previous record except floor space had been annihilated. For Omaha and Nebraska—yes, and for the factories, too—it has been a week of unqualified enthusiasm. Attendance, interest, optimism and direct sales far surpassed that of any previous show.

The show occupied the same quarters as last year, and consequently tractors and accessories were crowded out. But there was no lack of interest in these, as witnessed the crowds which swarmed the private display rooms on the row, just a few blocks from the Auditorium. Not only that, but the dealers worked to the limit the privilege accorded of demonstrating in the open streets surrounding the buildings occupied by the main show.

The daily average attendance ran close to 20,000. The doors were closed five times on the opening night. An unhappy score or so of factory men and demonstrators, caught late outside the portals in the milling crowd, blasphemed joyously as they swallowed their chagrin.

**Getting Down to Details**

Regarding the interest evinced, the experience of one factory demonstrator is an example. It illustrated also the study which Nebraska farmers have given the subject of motor equipment for their farms.

"Ladies and gentlemen," began this lecturer as soon as he observed that his exhibit was surrounded by a crowd which wanted to know about his car.

"All right, brother," a keen-eyed farmer cut him short, "We accept the nomination. But what is the clearance of this axle? We live in the sand hills, where this feature is important."

Another wanted to know about the oiling system, another asked about the piston rings, and so on. They didn't want a set speech on the advantages of any particular engine. They knew what features they wanted in whatever car they should decide upon. Farmers' day was just about the biggest of the week. The factory representatives had their hands full—and over 100 of them were here, but they didn't get a chance to deliver any lectures. All they had to do was to answer questions.

Yet it was not all a farmers' show, even though that is the big field of trade here. Nearly 3500 dealers attended the exhibition, and in addition to the regular territory of Nebraska, western Iowa, southern South Dakota and a corner of Colorado, they came also from Kansas, Wyoming and Missouri. As an example of what they wanted may be cited the case of Manager J. P. Linch of the Nebraska Paterson Co. He was much pleased when he sold the first car of the show in 3 min. He turned right around, however, and closed with a dealer for twenty-five cars in the same hour.

And that brings us to the matter of business on the whole. In the first three days of the show the sales ran to $500,000, and weren't warmed up. By the end of the week the dealers had quit trying to keep tab. They were too busy to compute totals until they could draw breath. Wednesday was the biggest day such a show had ever seen here, and every succeeding day beat the previous one. A single salesman sold eighteen cars that day, including twelve sedans. Nearly every one went to a farmer.

In discussing trade conditions in this territory it is difficult to lose sight for long of this oft-mentioned farmer. He bobs up in every story in spite of one. The reason is simple.

War's financing burden has rested rather lightly on the son of the soil. True, he has given outright as generously as any. He has also paid war prices with his city brother. But he could afford to. He raised bumper crops last year. He has a whale of a winter wheat crop in the ground, and the finest kind of a winter on top of it. His wheat price has been guaranteed—and he knows he can't lose. And with pork around $20 his corn crop is virtually on ice. In short, every farm product now commands a price not equaled in half a century.

As for Omaha, in spite of wartime restrictions last year, the automotive trade in this city increased from $47,528,030 in 1917 to $53,898,195 in 1918.

For concrete illustration of the prospect for new sales in this territory may be mentioned the comparison of new car registrations for 1917 and 1918. In 1917 the new cars registered in Nebraska, Iowa, Kansas, South Dakota and Wyoming numbered 242,833. For the same states in 1918, all of which are tributary to this center in whole or in part, the new cars registered were 138,918. So there is an abnormal demand for at least 100,000 cars in this territory this year, and this on top of the normal requirements.

To come back to the staging of Omaha's fourteenth annual show, it was the most satisfactory in arrangement and handling of any held thus far. The management and the dealers both learned a lesson from the crowding practiced last year, and there was ample room to view every exhibit. Perhaps even fewer cars were shown—the number was about 225—but the prospect could see all sides of the car in which he was interested, and congestion both in the booths and in the aisles was largely eliminated, despite the heavy attendance. For another thing, every exhibit was in place when the doors were opened, as were desks, lighting and incidentals. The workmen were out of the way. There was nothing to distract attention from the real business at hand.

The decorations were strikingly effective in bright colors. A promenade was built over a portion of the seats, so one could walk or sit and watch the scene below. Arrangements for the comfort and convenience of women were complete and appreciated.

Clarke Powell, secretary of the Omaha Automobile Trade Association, managed this show, as he has every other. It is not of record that Clarke lit on his feet during the week. Assuredly he never sat down. But when the week was over he hit the hay, a weary but exultant man.

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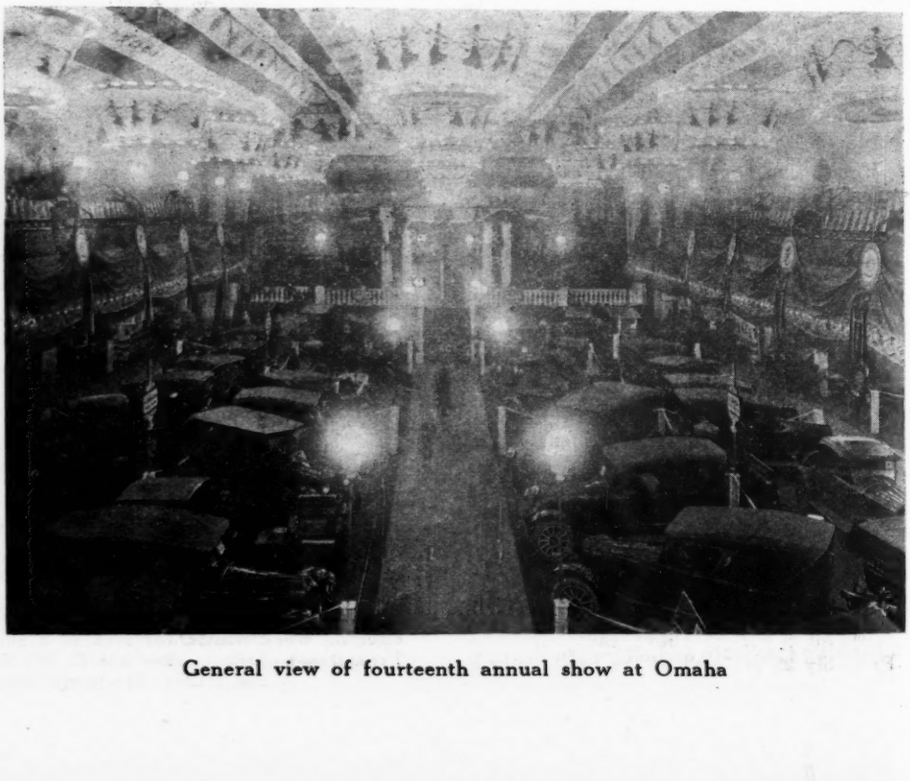
### ALL PEORIA SPACE TAKEN

Peoria, Ill., March 15—Weather conditions were adverse during the two final days of the ninth annual show of the Peoria Automobile and Accessories Association at the Coliseum, which ended to-day, but despite this handicap the attendance compared favorably with that of former years. Rain fell almost incessantly on Saturday, usually the big day of the show, and there was also a heavy storm on Friday evening. Conditions were satisfactory on the two



General view of fourteenth annual show at Omaha

opening days, and the attendance was heavy.

The third day was dealers' day and the fourth good roads day. All space was taken. The main floor was devoted to cars and the stage was set aside for the accessory exhibits. The hall is to be cleared now and trucks and tractors will follow.

It is expected that the truck show will equal the success of the car show.

### DETROIT MAY GET COLISEUM

Detroit, March 14—Detroit dealers may have a coliseum for next year's show. The lack of floor space is crystallizing in a movement which seems likely to develop into a lively campaign for the erection of a coliseum capable of meeting all future show demands.

The last was Detroit's largest, finest and most successful show in every respect, but the 80,000 sq. ft. in the Crosstown garage proved far from sufficient. Many dealers were unable to secure space while the lucky ones were limited to 1000 sq. ft. each. Several of the larger firms, handling two or more makes, had planned an extensive display of all models of their machines. Limited space, however, forced a change in plans and the number of cars shown was not a fair representation of their respective lines.

Nearly half the garage was given over to the truck and tractor show. Trucks and tractors probably will be incorporated in a separate show next year, and if the Automobile Dealers' Association chooses the same place for the show, the space problem will be mitigated but far from solved.

### EIGHTY ACASONS WEEKLY

Detroit, March 14—The Acason Truck Co., since completing war contract work a few weeks ago, has tripled production and now is turning out eighty trucks a week. From now on this company hopes to increase production until full capacity is maintained.

# Indianapolis Sees Vast Prospects

## Opening Week Gives to Dealers Foresight Into Future Car Demands

INDIANAPOLIS, Ind., March 14—The car has come back in Indianapolis, according to the Indianapolis dealers, who base their judgment on the success of the opening week which took the place of the annual spring show. More than was expected by most of the dealers, there was a strong appreciation on the part of the buying public of the car and its service to the family. So far as the visitors to the showrooms were concerned, the world war was history and there was little of the forced spirit of patriotic economy and self-denial evident last year.

So far as prospects are concerned, they are everywhere. That is the opinion of the Indianapolis dealers. Perhaps it is a natural reaction from the self-denial of last year, but there seems a tendency, as shown by the opening week, to buy cars of all types and makes, without any expressed consideration of costs and taxes and the other arguments.

There was never better indications for big business through the state than this year, so far as early spring demand is concerned. Indianapolis serves as the distributing center for the state and, out in the state, dealers generally speaking, get their cars through Indianapolis wholesalers. These sub-dealers came to Indianapolis in big numbers during opening week with the information that never were real, actual sales so numerous.

The feeling prevails in Indianapolis that for some months cars will not be sold, they will be bought, until the production of the factories catches up with the demand. How soon this will be is determined by the material market, labor costs and the readjustments of the big plants to peace conditions.

During opening week Indianapolis distributers vied with each other in making the salesrooms attractive. The displays of trucks brought good business. Motor truck competition in Indianapolis is growing. The demand for trucks is increasing.

The accessory stores played their part in the week's festivities and were decorated. The same may be said of the tractor establishments, which, for the most part, are geographically separated from the four rows of Indianapolis.

"The motor car demand is sure," said E. W. Steinhart, Cadillac and Dodge Brothers dealer and vice-president of the National Association of Automobile Dealers. "It will take some time before the factories will be able to supply this demand, made a bit unnatural by the circumstances of war. From now on, new methods must be used in selling motor cars, new tactics and better work."

### MOTOR ROW IS PLANNED

Little Rock, Ark., March 15—Five local dealers have agreed to make joint plans for buildings to accommodate their business as the foundation of a motor row for this city. The move is explained by a statement from C. E. Faulhaber of the Little Rock Motor Car Co., who says dealers are now in the high rent district, which is not suited to their business especially, and that practically all of them are confronted with the necessity of expanding their premises but find it impossible to do so because of old-established businesses that are neighbor to them.

The companies that will hang together in this enterprise are the Little Rock Motor Car Co.; the E. M. Rowe Co.; the Paige Co. of Arkansas; the S. R. Thomas Auto Co., and the Oilar-Overland Co.

Some of these companies have plans drafted for buildings but have not yet selected the sites. Altogether the company spokesmen indicate that they will erect, or lease specially erected buildings, that will cost more than $500,000. Several companies whose leases expire next year have indicated that they will be glad to join these companies in a suitable row. South Main street is favored.

### PROCESS FOR MOTOR FUEL

Washington, March 14—The Motor Fuels Co., St. Joseph, Mo., which has a process for forming motor fuel for internal combustion engines from fuel oil, developed by S. M. Herber, president of the company, is placing its process on the market. The fuel, it is claimed, can be made at a cost not to exceed 6.5 cents a gallon from fuel oil valued at 80 cents a barrel at the refinery and which tests from 24.5 to 28 gravity, Baume, after all kerosene and gas oil products have been distilled out by the usual methods, or from crude oil of the same character. This fuel, it is said, will stand as high a test of efficiency as a motor fuel as the 58 to 59 gravity gasoline now sold and used by the general public.

# St. Louis Sells 147 Used Cars

## Show Also Brings Future Prospects

ST. LOUIS, Mo., March 15—Exhibitors at the used car show reported 147 sales of cars on the floor of the show and supplemental reports were that they thought that between 100 and 150 sales would be closed within the next ten days as a result of show prospects. Several of the prospective sales are of cars that were not in show condition and were shown to prospects at the salesroom, the sale being conditional on polish and paint work.

These sales leave practically no used cars on the local market for less than $1,200. The prices on light cars were slightly above the pre-war new price. Exhibiters of heavy cars expressed surprise at the number of cars sold at the show. Several Cadillacs and similar types were sold.

Dealers say in appearance the cars were fully 40 per cent above the 1918 show. Probably 25 per cent of the heavy cars on display carried cards of the painting firms that had renewed their appearance.

The attendance was practically level with that of the 1918 show, with the difference that there were very few merely curious persons present. Practically all were looking for a car. The slippery roads, resulting from a snowstorm on the previous Sunday and rains on Friday and Saturday held the country attendance below the expected figure.

Each car exhibited carried a guarantee of the technical committee as to its condition. The highest number of cars on display at one time was 185. Reservations had been made for 185.

Late this week several exhibiters, asserting that they had no cars, placed trucks in their space. Five truck sales were reported, but the exhibiters were not pledged to report such sales.

# State Highway Work Gets Under Way

## Colorado Has 51 Miles Under Construction and Others Have Let Contracts

WASHINGTON, March 14—Additional details of highway construction received here indicate that the entire Nation is awake to highway value.

Colorado has 51 miles of highways under construction at a cost of $300,000; 91 miles ready for contract, to cost $360,000; and 30 miles and three bridges contemplated, to cost $350,000. Maintenance on 4000 miles will amount to about $500,000, while local road and bridge expenditure will amount to about $2,200,000.

Idaho has 87 miles, costing $720,000, under contract; forty-five bridges, costing $425,000, ready for contract; and about $1,800,000 worth of additional work is contemplated during the season.

Iowa will expend $15,000,000 on the road system of the state, of which about $11,000,000 will be for road and bridge construction.

Missouri has 666 miles under contract, costing $1,785,100; 888 miles, costing $3,104,000, ready for contract; and about $3,000,000 additional construction is contemplated. Local road and bridge expenditures in the state will amount to about $7,000,000.

Nebraska has 173 miles, costing $431,000, under contract; 145 miles, costing $550,000, ready for contract; and about 610 miles, estimated at $1,310,000, contemplated. Local road and bridge expenditures will amount to about $3,000,000.

Nevada has 4 miles, costing $54,666, under contract; 102 miles, costing $657,412, ready for contracts, 123 miles, costing $523,000, contemplated. Local expenditures on maintenance will amount to $600,000.

Oklahoma has 178 miles, including eighty bridges, costing $1,360,000, under contract. Additional construction of 165 miles, costing $2,500,000 is contemplated. Local road and bridge work will amount to about $2,200,000.

These amounts will be supplemented by increased Federal Aid appropriations and later, it is hoped, by national construction of main trunk lines under the supervision of a Federal Highway Commission, as provided for in the Townsend bill which will come up for consideration by the next Congress.

### MICHIGAN TO VOTE BONDS

Detroit, March 14—Michigan's progress as a good roads state depends largely on the action of the voters when they ballot April 7 on the constitutional amendment permitting the state to issue $50,000,000 bonds for the completion of the 4800-mile trunk line highway system.

The Detroit Automobile club, Michigan Good Roads Association and rural express organizations interested in good roads are standing behind the movement for the bond issue, which road boosters believe is going to result in a satisfactory network of highways for the state. Provision is made for the expenditure of not to exceed $50,000,000 on trunk line roads, this money to be apportioned as the legislature sees fit.

There are to-day about 1200 miles of improved roads in the 4800-mile trunk line system. Highway experts think it doubtful if the $50,000,000 will be enough for the complete system.

### ARKANSAS MOTOR BILLS

Little Rock, Ark., March 14—A senate bill providing for two modern highways across the state was among the many meritorious measures not finally acted upon when the Arkansas assembly adjourned yesterday. The highways were to be paid for through a tax of $15 on cars levied by counties traversed by the roads. The bill died on second reading in the house.

A bill to prohibit mutilation of serial numbers of cars, tires and engines as a means of guarding against theft was passed.

### TRUCK SHOW NOW ON

Philadelphia, Pa., March 17—Special telegram—The second week of Philadelphia's show opened to-night with trucks, tractors and trailers occupying the floor instead of the cars, which were removed Sunday. This is really the first time trucks have been given a real show here, and the number of exhibits is most gratifying. Last fall an outdoor truck show was held at the Philadelphia county fair at Byberry, but this year the entire Commercial Museum is used, and there are over 200 vehicles on the floor. Of this number 185 are trucks, five are trailers, five are truck converters and five are farm tractors. There are sixty different makes displayed. Vim shows its heavier trucks for the first time at any show, these being of 1, 2 and 3-ton capacity. One of the models has been in use eight months, but the heavier ones have only been in production two months.

An entirely new truck is the one made by Keystone Motor Truck Corp., Philadelphia. Its capacity is 2 tons; wheelbase, 128; price, $1,795; 4 by 4½ North American engine, Borg & Beck clutch, Covert gearset, Russel internal gear axle and Timken front axle are used. The first model completed is shown. Production will start in May.

Three body builders are showing eight bodies, and most of the accessory exhibits remain from last week, changing the character of the exhibits to interest truck users. The tractors attracted much notice, as this is the first public showing in this territory.

### LITTLE ROCK SHOW REPORT

Little Rock, Ark., March 14—The Little Rock Automobile Dealers' Association met at a luncheon at the Hotel Marion at noon Wednesday and discussed possibilities of having a used car show at an early date. No definite plans were made, however.

Committee reports on the show which closed last week showed that 5164 paid admissions were received. The second annual show was one of the most successful events of its kind in Arkansas. Figures show that sixty-eight persons out of every 1000 attended the show.

### PLANT FOR CLEVELAND

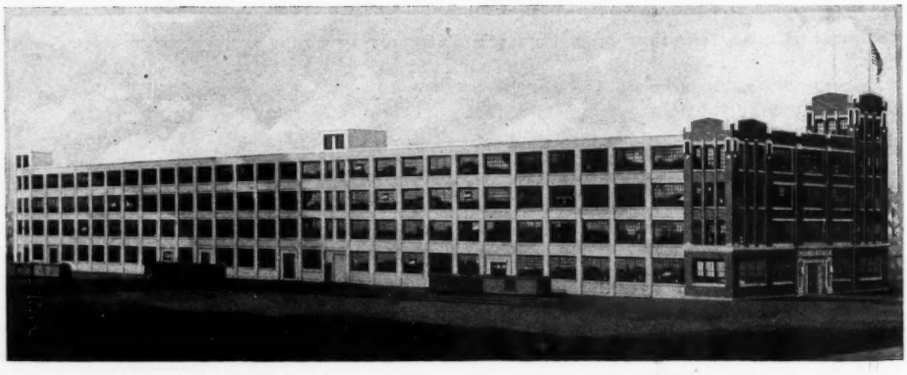
Cleveland, Ohio, March 14—The new plant of the Cleveland Automobile Co. recently organized by Chandler Motor Car Co. officials to produce a $1,300 car, will cover approximately 200,000 sq. ft. of floor space and will cost $650,000. The plant is to be completed and the company in operation by July 1.

Contracts have been let for the plant, which is to be built on a recently acquired 19-acre site in this city. Officials of the company expect that even before July 1 the plant will be in operation and producing Cleveland cars at the rate of 150 daily. From 1200 to 1400 workers are to be employed.

The company has chosen the following officers: President, J. W. Whitbeck; vice-president, Sid J. Black; treasurer, J. I. Krall.

### CARS "UNMARKETABLE STAPLES"

Washington, March 14—The Federal Reserve Board has classified cars as "not marketable staples," and as a result many rediscounts on dealers' notes are being refused by Federal Reserve banks. In the case where the dealer is discounting his notes directly with the Federal Reserve Board there appears to be no objection on the part of the Federal Reserve Board, but



Plant which is being erected for the manufacture of the Cleveland car

they refuse to approve or allow rediscounts where the note is passed through other hands, beginning with the note broker.

There is no clue available as to the reason for this classification of passenger cars. Alfred Reeves, general manager of the N. A. C. C., is in Washington and has conferred with the Federal Reserve Board commissioners. He pointed out to them the shortage of cars, the utilitarian purpose for which they were purchased, the size of the industry, the general substantial status of the dealers, etc., and expects that the board will revoke its decision and treat cars as marketable staples.

### KRAMER JOINS OVERLAND

Toledo, Ohio, March 15—LeRoy Kramer, for many years vice-president in charge of manufacturing of the Pullman Co. of Chicago, has been appointed vice-president of Willys-Overland in charge of production. Mr. Kramer succeeds C. O. Miniger, who retired March 1 to devote his entire time to the presidency and general management of the Auto-Lite Co.

### MALONE MAKES CHANGE

Philadelphia, Pa., March 14—J. H. Malone, advertising director of the Chilton publications, has resigned to become vice-president and general manager of the William F. Hudson enterprises, this city, namely the Hudson Motor Specialties Co., Hudson Motor Axle Co., Precision & Thread Grinder Mfg. Co. and Hudson Peck Machine Products Co.

### WILLS LEAVES FORD

Detroit, March 15—C. H. Wills, factory manager of the Ford Motor Co., who has been associated with Henry Ford for nearly eighteen years, has resigned and, while unprepared as yet to make any definite announcement of his plans, states he is going into a manufacturing business somewhat similar. Mr. Wills has had charge of the designing and manufacture of every car the Ford Motor Co. has produced since its organization, June 16, 1903. He has designed special machinery and equipment and originated methods and processes of manufacture to solve various industrial problems. Several inventions of his were far beyond the experimental stage when the armistice was signed.

### LITCHFIELD BACK HOME

Akron, Ohio, March 15—P. W. Litchfield, vice-president and factory manager of the Goodyear Tire & Rubber Co., has returned from Europe after two months spent in England, France and Italy inspecting various plants connected with airships. With Ralph Upson, Goodyear balloon expert, and Clifford Slusser, Goodyear efficiency manager, Mr. Litchfield formed the civilian part of a military committee sent to Europe by the Navy Department for this purpose.

Mr. Litchfield also was authorized by the War Industries Board to study performance, operation and repair of tires in the foreign countries. His report will be used by the Government in analyzing tire conditions as related to military service.

# Indiana Wants Full Highway System

## Commission Bill Before Assembly Would Connect All Towns Above 5,000

INDIANAPOLIS, Ind., March 15—Indiana is to have a fine highway system. Not that Indiana's roads are the worst now, but the passage of the highway commission bill by the Indiana assembly means that by April, 1920, a full system of roads will be under way, connecting every county seat town or city of more than 5000 population.

Indiana, now that the highway commission is backed by the right kind of law and court decisions, is ready to match the Federal funds available for road building up to 1921, meaning that upward of $15,000,000 will be spent on the highways by that time.

The bill was a pet measure of Governor Goodrich and the state administration and received the support of the Hoosier Motor and the Hoosier State Automobile Clubs. The county has been made the road-building unit, though the 3-mile road law, under which Indiana has been building most of its roads, will be continued.

Indiana's highway commission is to consist of four members, no two to come from the same political party, to be named by the governor. They shall serve for a nominal salary, insuring the highest type men instead of political plum-seekers. This commission, with the governor, shall name a director of highways. Governor Goodrich is expected to name the four commissioners without much delay. There is available for road building in Indiana $2,161,392.44 of Federal aid money which must be matched by the state. The state funds available this year amount to $1,896,766.21, made up of $796,767.21 of inheritance taxes. The unused appropriation for 1917 was $100,000 and for 1918, $500,000. The estimate on the inheritance tax for this year which is available for road building is $500,000. Including 1921, there will be available for Indiana $7,428,078.10 from the Government. Let Indiana match this amount, and the total sum to be expended in road building will be nearly $15,000,000.

The new law provides for a levy of 10 cents on the $100 for the state highway commission fund. Under the county unit law bonds may be issued up to 2 per cent of the assessed valuation, while under the 3-mile road law, the bonding limit is 4 per cent.

### I. H. C. INDUSTRIAL PLAN

Chicago, March 15—Self-government is the feature of the new plan adopted this week by the International Harvester Co., whereby the 30,000 employees of the concern are to have a voice in shaping the policy under which they shall work. The workers at fourteen of the seventeen United States plants and all three Canadian factories insured the adoption Wednesday, when elections were held. The plan is called the Harvester industrial plan of employees' representation. The three plants where the proposition failed of approval are the McCormick works, McCormick twine mill and the tractor works here in Chicago.

The chief feature is the establishment at each plant of a works council for consideration and recommendation to the management in regard to working conditions, health, safety, hours, wages, recreation and education. The works council will consist of an equal number of workers and representatives of the management, the workers to elect their own members.

### OLDS TO BE ENLARGED

Lansing, Mich., March 14—W. C. Durant, head of the General Motors Corp., has disclosed the general plan for the expansion of that company's property in Michigan, and it provides for vast improvement in the Olds Motor Works.

A substantial part of the General Motors appropriation for 1919 will be spent in Lansing. The general plan calls for additions to present factory buildings to care for proposed increased production and a great increase in the working force. General Motors will go in extensively for trucks this season. The plant of the old Reliance Engineering Co. will become a producing unit of the corporation but the nature of the product it will turn out is not revealed.

### PREMIER EXECUTIVE COMMITTEE

Indianapolis, Ind., March 14—A committee of three has been formed to take over the active management of the Premier Motor Corp. This committee is another name for the manufacturing committee which has been in control of several phases of the company's activities for the last few years and is composed of the same members: C. S. Crawford, F. T. Nehrbas and E. F. Schaeffer. The manufacturing committee has been changed to the executive committee so it can take over some of the duties of the company's president, A. C. Flowers, who is unable at this time, because of other financial interests, to devote all of his attention to Premier affairs.

### 3000 WHEELS A DAY

Geneva, N. Y., March 14—The National Wire Wheel Works, Inc., maker of Pasco wire wheels, have arranged for additional factory equipment at Hagerstown, Md. With this and the present factory, the company will be prepared by June 1 to manufacture 3000 wheels a day and will arrange the equipment to still further increase this production as required. During the last year the concern has been practically all devoted to Government production on airplane wheels and airplane engine parts. Direct factory selling branches have been opened in New York, Chicago, San Francisco, Kansas City, Dallas, Seattle and Minneapolis, as well as nine of the largest cities in Canada. With these selling branches have been established completely equipped service stations in the larger cities.

# The Tractor Comes to Dixie

## Tractor Makers Find Wonderful Opportunity to Solve Cotton Problems of Southeast

MACON, Ga., March 13—The American tractor manufacturer is awakening to the vast possibilities of the South. The necessity of the southern farmer awakening to the importance of tractor farming has been driven home. These are two of the great thoughts at the conclusion of the Dixie National Power Farming Demonstration to-day. Owing to the wet condition of the field, no tests were held, so that affair resolved itself into an educational campaign, and as such it will go down in history as one of the biggest things the South has ever seen. The feeling is almost unanimous that this demonstration was the greatest ever held in the country. Conservative estimates place the crowd for the three-day event at something like 50,000 persons, all bubbling over with enthusiasm for the chance to see the tractors and implements in action. Many saw tractors the first time.

The makers who came to Macon feel repaid three times over. While there was apparently no great effort to make sales, many are reported from the various representatives. But the big job immediately ahead of the makers is to get distribution in the South, with service, which naturally follows. The demonstration was timely. Labor conditions in the Southeast are nothing short of tragic in certain parts. The result is the cotton states have never raised enough feedstuffs for their own needs, and thus millions of dollars go to the Middle West corn-producing states to supply the deficit. Money will stay in the South, cotton marketing conditions will be better and foodstuffs plenty if feed crops are planted instead of the usual acreage of cotton.

By B. M. Ikert
*Motor Age Editorial Staff*

One of the greatest aids in the solution of the all-cotton problem from which the South has suffered for more than a generation is the tractor. The use of the tractor is going to result in diversification of crops. It will curtail the labor force during the planting season, and when harvest time comes there will not be enough labor to pick all the cotton that can be grown even under the changed conditions.

The soil conditions here are typical more or less of the entire Southeast, and the tractor, whether of the high wheel or crawler type, performs as well as in Iowa or Kansas soil. This was proved conclusively at the demonstration, where all machines operated equally well, even though the soil was not quite dry enough for plowing. The tractor will be a paying investment here when used for the varied field and orchard work.

For the first time in the history of the country tractors were used in the peach orchards. Wednesday afternoon the machines were turned loose in the peach orchard on the John T. Moore farm about 3 miles south of Macon, and the vast crowd of Southern farmers, practically every one of whom has a peach orchard, was shown how easily and deftly the machines could creep up close to the trees and cultivate the soil, which now is done with a donkey, usually, pulling a single small plow. The enthusiastic verdict of men who constantly have their fingers on the agricultural pulses of the country was that the lay of the land, the great orchards and the very soil itself is ideally suited for power farming, especially since the farmer cannot get enough help and distances are vast.

It is very likely the next demonstration here will be held in the fall of the year, as the Southern farmer must be taught the value of fall plowing. At present only about 25 per cent of the plowing is done in the fall. This will be one of the phases in the great educational campaign which makers and dealers alike will have to carry on now that the tractor and power farming generally have gained the initial hold on this part of the country.

One of the most gratifying parts of the demonstration was that the great majority of farmers present were not merely onlookers, but men who had been sent many miles by their communities to get a line on the machines, and report when they got home. They were the fellows the makers were anxious to show. It is a big mistake to think the South will be slow to buy tractors. Rather the makers have never considered seriously the South's possibilities. The farmers who saw the machines work on the Moore farm visualized the tractors and plows on their own fields, for operating conditions were much the same in both instances. Thus they got a pretty good line on what to expect in their own cases. True, there were some who could not see the tractor as yet, but these were mostly the fellows working small farms. The big land owners did not have to be shown very long. Many would no doubt have bought, but the woeful condition of distribution and service said no for the present. This is not true of all machines, for the Fordson already has good distribution here.

Aside from the tractors operating in the

**At the left are cars of farmers in Macon, while at the right are some of the tractors**

fields and orchards there were scattered over several acres exhibits of farm machinery of every kind, and private demonstrations were carried on as far as the eye could see. The concerns here included: Case, with tractors, plows and harrows; Moline, with tractors, grain drills, slated mold-board plows, orchard cultivators, disk harrows and other apparatus; Avery, Parrett tractors; Holt; National; Hart-Parr; Cleveland; Frick; Advance-Rumley; Huber; Power; Lauson; Oliver; La Crosse; Russell; National; R. & P.; International Harvester; Fordson; Whitney; Illinois; Waterloo Boy, and the Beeman garden tractor. Oliver, McKay, Sanders, John Deere, Grand Detour, P. & O. were the plows represented.

Throughout the streets of Macon were scattered exhibits of every description. On one corner was a Case operating a peanut thresher, designed to become a great time-saver in the South. It is fitted with a wind stacker which piles up the peanut vines and an automatic feeder. The makers say forty of these threshers have been sold during the demonstration, as they are just the right size to be used with the small tractor. It can be converted into a thresher for oats, wheat, beans and other crops. Some of the larger peanut growers in this section expect to put in as many as four or five of these on their farms. Case also exhibited the revolving cutaway model shown at Kansas City in the Hotel Dinkler, its headquarters. Other Case machines lined the curb at various parts of the city. Hart-Parr rigged up a scaffolding and was demonstrating the strength of its steering cables by lifting the tractor's own weight, the same stunt as at Kansas City. There were numerous other exhibits; the Alamo and Western Electric farm light outfits were shown, as well as milking machines, pumping outfits and in fact, nearly everything to motorize the farm.

**Governor Signaled Start**

The demonstration was scheduled to begin Tuesday afternoon with Governor Hugh Dorsey on the field to give the signal to start, but owing to the wet field, Manager A. E. Hildebrand would not let the machines on the land. So the demonstration Tuesday was confined chiefly to downtown exhibits, including a tractor parade, something unusual at tractor meets. Governor Dorsey arrived at noon Tuesday and after luncheon at the Hotel Dempsey was driven to the grounds with Mr. Hildebrand and a party of business men, nearly all of whom had suspended business for the three-day show. Although no machines were on the field the governor gave the signal and the Dixie demonstration was on. Governor Dorsey said the state council of defense took up the tractor question and was instrumental in getting the demonstrations here. Sixty questionnaires were sent out to farmers, asking them what they thought of tractors. Thirty-seven thought tractors the most needed thing in the South. Fifty-two replied to the questionnaires. Cost of operating was estimated at $2 an acre and the upkeep of the machine, about $18 a month, not including wear and tear. The thirty-seven farmers stressed the importance of the tractor on Georgia soil. Tractor officials and plowmen have stated that the land will produce twice as much with fall plowing and proper attention to subsoiling.

In this regard the McKay plow made by the Towers & Sullivan Mfg. Co., Rome, Ga., is interesting, as it has been designed particularly for Southern soil conditions. The chief feature of this plow is its ability to conserve moisture in the soil, even though this is not distributed evenly throughout the growing season. The subsoiler running in the bottom of the furrow breaks the substrata of hard soil or "plow sloe." This allows the moisture to penetrate and gives the root a chance to go deeper for the available mineral plant food essential. The pulverizing influence of this plow shows a striking contrast when compared with ordinary plowing. When plowing deep it brings only a small portion of the sub-soil to the surface, yet the seed bed is thoroughly pulverized and left in a porous state. The maker of this plow, as well as farmers who have used it in the South, claims an increase in production anywhere from 15 to 40 per cent. Light draft is obtained because the angle of the disks is set to give it a slicing rather than a scooping movement, and this enables the plow to cut and turn at a very small expenditure of power.

The Oliver tractor, a Southern product hailing from Knoxville, Tenn., was demonstrated for the first time at Macon. It is of the crawler type fitted with a 30-hp. valve-in-head engine. It is said to be especially adapted to the hilly condition of this part of the country, where there are so many terraced farms. This machine is said to have a pressure on the ground of only 5¼ lb. a square inch. Pulling a McKay plow it has received much favorable comment from Southern farmers, both having been developed by men well acquainted with the needs of the Southern farmer.

Visitors came not only from the surrounding states but as far away as Cuba and Brazil. There were large county delegations. The great army of tractor and implement men had to divide into squads, some to take care of the crowds in the city and others those on the fields.

Wednesday was county agents' day, there being several hundred of these men present. Dr. A. M. Soule of the state college of agriculture was here for several days, as well as J. P. Campbell, director of farm extension work in Georgia. Secretary Harry Robert of the state fair association secured the assurance of the Case, Avery and Moline companies that they would attend the state fair this fall with their tractors. Railway officials consisting of J. L. Edwards, manager of the agricultural section of the division of traffic for the U. S. railroad commission; W. W. Croxton, general passenger agent for the A. B. & A. and other lines, and W. R. Tucker, supervisor of farm markets, came here to get information about power farming to pass along to the farmers not able to attend. Among the arrivals Wednesday was G. T. Hardin of the Tennessee experimental station who came to buy three tractors for the large farms operated by the state college.

The tractor has come to Dixie to stay. Those who witnessed the demonstration and saw the convincing look on the faces of the Dixie farmers had to use little imagination to see that the Southern farmer realizes the diminishing man power must be replaced with motor power and thus bring back thousands of acres to productiveness. Many of the farmers realize fall plowing is the thing here, but they need the tractor badly to carry this out.

It is quite certain that out of the 300 carloads of farm machinery representing something like $1,000,000 there is some to suit the special taste of every potential buyer in the South. The tractor maker, having had this wonderful opportunity to show his wares, must go a step further and get distribution as soon as possible. Agencies have been established in Macon as follows: Planters' Implement Co., Moline tractors and implements; Middle Georgia Paige Co., J. I. Case T. M. Co.; G. W. & T. W. Gilmore, Cleveland tractors; McCord & Satterfield, Fordson; Stocks & Bacon, Beeman garden tractor.

The Macon chamber of commerce is to be congratulated upon the excellent way it staged the big demonstration, which exceeded the expectations of everyone. This association stood all the expense and looked after transportations, hotels, etc., to the minutest detail. Manager Hildebrand is intensely pleased with the results of the demonstration and states there was not a single complaint from makers or farmers. Many of the exhibitors will keep their machinery on the field until the end of the week, as the crowd of interested farmers insist on seeing the machines operate. Two of the local theaters are showing moving pictures of power farming, one featuring the Moline and the other the International line.

## MACON USED CAR AUCTION

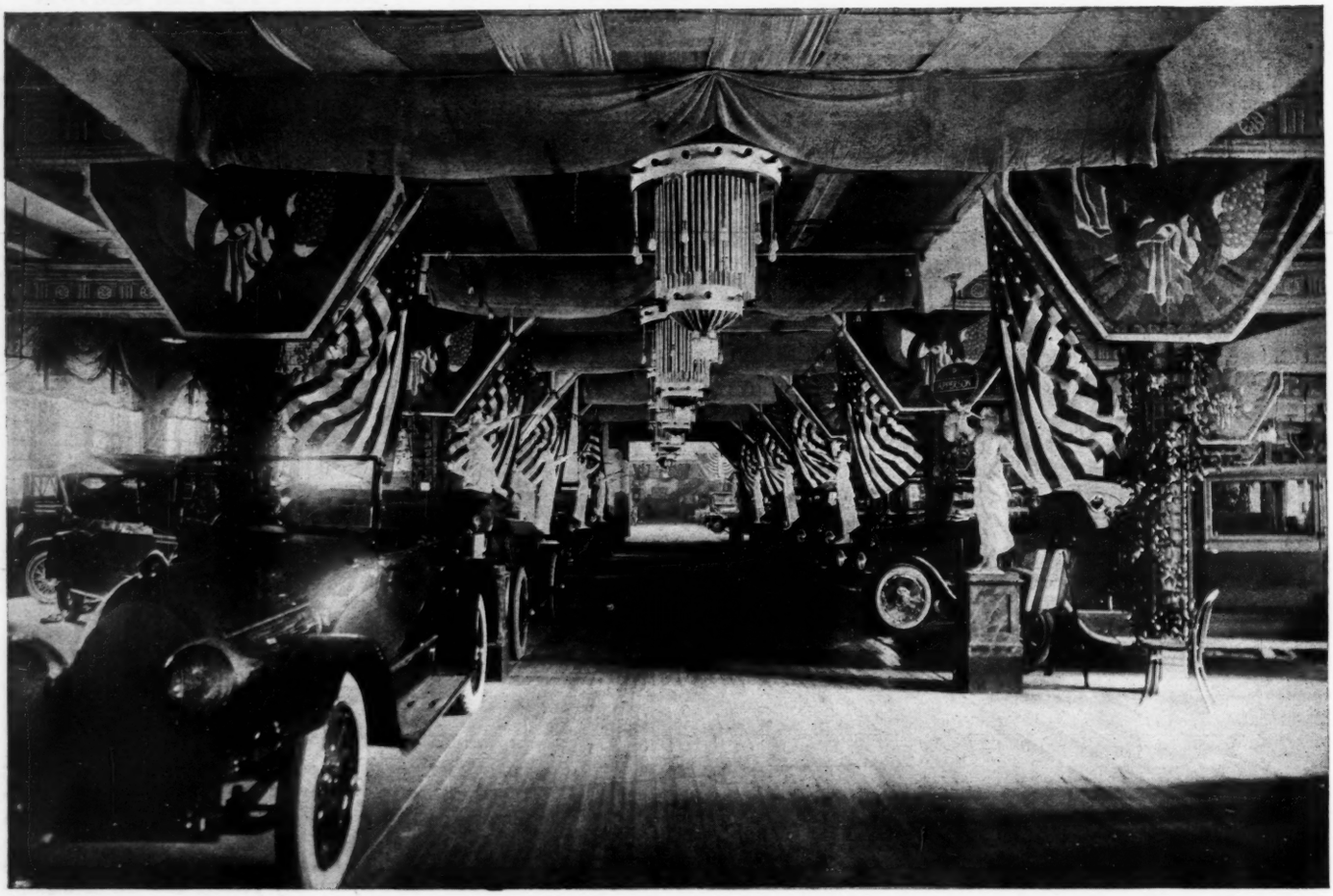
Macon, Ga., March 16—Macon held a two-day auction of used cars this week. It was the first time this has ever been attempted here. Seventy-five picked and tested cars, ranging from Fords to Packards, were moved into the machinery hall at the state fairgrounds for the auction, which was held on the half-mile track in Central City Park. The cars ranged in value from $200 to $1,500.

The sale prices were from 30 to 60 per cent of the real values, however, most of the dealers being willing to make the sacrifice to establish the public sale as a successful annual event and to get more room. Fourteen cars were sold Wednesday morning, bringing in about $5,200. The second day fifteen cars were sold, bringing the total sales up to about $15,000. The sale was held under the auspices of the Macon Automobile Association.

## DEALER CALLS IN FACTORY MAN

Macon, Ga., March 16—The idea of bringing a factory man to a service station to inspect cars of the dealer's clients is one that might well be followed by other dealers. This was done during the last week by the Reo Macon Co., which handles Reo cars and trucks. Reo owners drove their cars to the service station, whereupon Harry Bleiler, a Reo factory expert, took the cars out for a short run and checked the performance, advising the owner of any adjustment or repair he deemed wise to make. This service was gratis to the owner, the local dealer cashing in on the deal by usually getting the job of making the necessary repairs or replacements.

# Boston Show a Stepping Stone to Good Business Year



**Eagles of victory adorned the posts in Grand Hall, while around the balcony were placques bearing the names of the officers of New England's 26th Division and the battles in which this division participated**

# New England Selling Season Opens at Boston

BOSTON, Mass., March 17—Special to MOTOR AGE—Boston's seventeenth annual show is providing a stepping stone to what the dealers believe will be a very good business year. The attendance Saturday night, when the show opened, exceeded that of last year, and there are indications that the attendance will break all records as has been the case with most of the shows held this winter.

The Boston show always opens the selling season in New England. It comes at the beginning of touring weather and is always a buying show. Indications thus far are that the show will live up to its buying reputation. Saturday night dealers, who seldom make show sales, made four and five sales apiece.

New England has made a lot of money this year. Her farms and forests have been productive, and central New England has been very busy with munitions and other work. Many of the emergency factories erected will be continued with peacetime products, and there is every indication that prosperity will continue. This has opened up a new buying market. In the low-priced field are many buyers who have earned big wages, and throughout the territory is a deferred market which will now come back rapidly.

**Good Business Already**

Distributers say dealers out through the territory already are getting good business and the retail trade in Boston began to come back about the first of the year. January and February were pretty good months. Among the conservative New Englanders mostly outside the trade, distributers say, are a few who can't see good business. They are the same ones who could not see prosperity when war demands were made on New England's shops and factories. There is hardly a man with his finger on the pulse of business who is not highly optimistic over the coming 1919 trade.

The show, as usual, is held in Mechanics' building and is decorated in the typical Boston way. This year it is a victory show, and there are little statues of victory blowing a horn, along all the aisles. Flags of the Allies are worked in in profusion and in Grand Hall are numerous placques bearing the names of officers and of the battles in which the 26th Division participated, this division being made up of New England men.

In previous years the truck show always has been a feature of the Boston exhibition, and were space available Boston could put on this year one of the best truck shows ever held. The truck show used to be held in the basement, but this year this space is taken up for the storage of Government goods, and there are no trucks at all in the show. In place of this, a large bulletin board at the entrance carries the names and addresses of all the Boston truck dealers. The dealers are doing considerable newspaper advertising and endeavoring to hook up their business with the car show.

Truck dealers say their business has not been as active during recent weeks as it will be in from thirty to ninety days. All state they see a big future ahead for truck selling in New England and they expect this market to open up actively in a very short time.

There are no tractors in the show because there is no room, but the dealers are interested in this subject and are investigating it. One of the things they are investigating is what type of tractor will best operate on hilly New England farms. There are, of course, farms on which no tractor can operate, but there is a considerable acreage of quite hilly land which probably can be successfully worked by certain machines.

The automotive equipment division of the show is, as usual, representative and important. It contains a smaller percentage of less stable manufacturers of products and is studied with interest by all the show visitors. The automotive equipment occupies approximately the same area as heretofore with the exception that a small piece of the basement, not large enough for showing trucks, was available and was turned over to equipment exhibits.

As has been the case in other shows this winter there is little that is new, yet the dealers, by securing special bodies and by giving cars special color treatment, have been able to give the public something to look at and talk about.

The new Metz Master Six could not get into the show because of lack of space, so is exhibiting in its own salesroom on Boylston street.

The newspapers are giving the show good support and are carrying about 50 per cent more advertising than last year in their Sunday sections. The show is providing a great stimulus for spring business, which business has really been under way for some time and will be greater during the next few weeks.

## KALAMAZOO TO TAKE LANE

Kalamazoo, Mich., March 14—The Kalamazoo Motors Corp. is being organized with a capital of $250,000 to take over the business of the Lane Motor Truck Co. The new organization will be perfected within the next few days. In addition to enlarging the present truck business, the new concern will be the nucleus around which other concerns will be gathered. The company now holds the patent rights on an axle that is being subjected to severe tests. This axle will be manufactured in addition to the regular truck line. M. H. Lane will dispose of his interest in the plant and go to Florida.

## NEW YORK DEALERS ELECT

New York, March 17—C. M. Brown has been re-elected president of the Automobile Dealers' Association. W. C. Poertner and William Parkinson were re-elected vice-president and treasurer respectively. The new board of directors consists of H. R. Bliss, Colt-Stratton Co.; C. M. Brown, the Winton Co.; H. J. DeBear, Maxwell Motor Car Co.; R. J. Gilmore, Packard Motor Car Co.; C. H. Larson, Cutting-Larson Co.; William Parkinson, William Parkinson Motor Sales Co.; W. C. Poertner, Poertner Motor Car Co.; A. G. Southworth, Buick Motor Co.; W. D. Stewart, Willys-Overland, Inc., and W. A. Woods, Van Cortlandt Vehicle Co.

## MITCHELL TO HEAD AIR SERVICE

Washington, March 14—Maj. William L. Kenly, director of military aeronautics, has been relieved of that post to-day and in his permanent grade of Colonel was ordered to report to the Chief of Field Artillery for duty. Brig. Gen. William Mitchell, who has been in charge of the Flying Service of the American Expeditionary Forces, and who formerly had charge of the Flying Section of the Signal Corps, will be detailed to command the Army Aviation Service. The change in command it was said at the War Department today, was the natural result of the reduction in that branch of the Army Service.

## TO COMPLETE L. H.

New York, March 17—W. C. Durant, president of General Motors, will contribute $100,000 out of the company's funds for the construction of the last remaining bad stretches of the Lincoln highway. These are east of Falon, Nev., in Churchill county. There is one stretch of 12 miles in the Fallon sink which will require an expenditure of $60,000 with a similar amount from the Government. Another stretch of 8 miles at New Pass, Nev., in White Pine county, will take the remaining $40,000 for repairs. With the completion of these repairs, all of the bad stretches between Cheyenne, Wyo., and Reno, Nev., will have been abolished.

## F. R. P. BACK FROM WAR

Dayton, Ohio, March 14—Finley R. Porter, who has completed his work with the Division of Military Aeronautics, has opened headquarters in New York at the Engineers' Club. R. B. Porter, his son, will be associated with him.

Mr. Porter's immediate plans call for designs of some heavy engines for transatlantic ships. After that he no doubt will enter the motor car field again to begin production of the FRP cars in addition to building two or three types of aviation engines.

Mr. Porter has been with the Bureau of Aircraft Production for the last ten months as chief motor engineer.

# Curing Electric Troubles

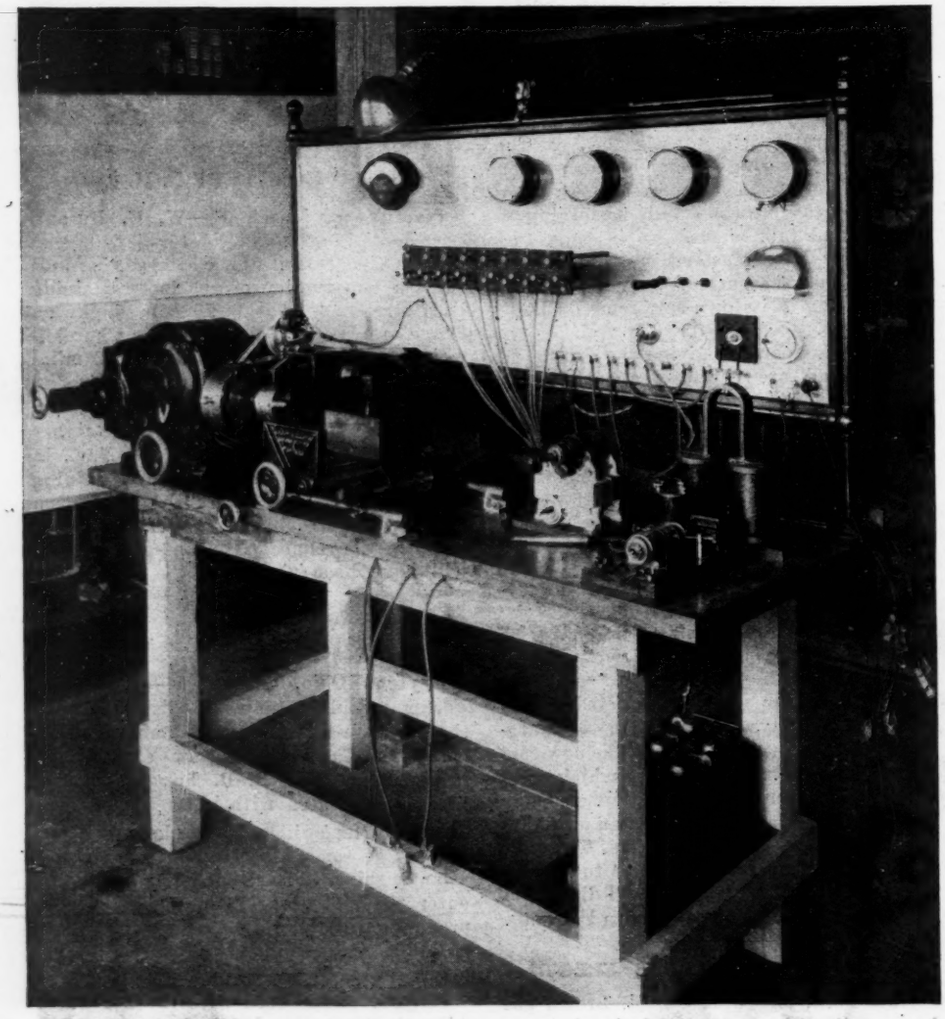
## Apparatus Which Promotes General Repairmen to First Class Electric Service Men

NO matter how skilled a mechanic may be, he is often helpless and must work by guess if not equipped with the proper apparatus to enable him to apply his knowledge intelligently. Good testing equipment eliminates guesswork and waste of valuable time. With the right kind of testing apparatus your repairman or serviceman can tell in a few minutes the exact condition of, say, any electrical equipment brought in for repairs or test. Accurate estimates can be made for the customer and disputes about costs for repairs avoided. With such equipment a customer is bound to feel his job will be done right. In case the customer disputes the performance of a magneto or generator you may have repaired for him, all that is necessary is to put the apparatus on the testing apparatus, and let him read the meters. In other words, the job speaks for itself.

The E. S. Cowie Co., Kansas City, Mo., whose establishment was described in last week's issue, makes its own equipment of this kind, especially for electrical repair work. The test apparatus which this concern has built into one unit is a beautiful piece of work and typical of the kind we might expect to see in the future in leading service stations. Regardless of how good a trouble shooter you may have in your service department, he will make more money for you with good testing equipment. If your man is not altogether up on electrical matters, all the more reason for putting in a bench similar to this. This outfit has brains built right into it. Even if a person knew nothing about electrical matters he soon could learn to use this test outfit and know his diagnosis of trouble to be correct.

Anyone having occasion to do electrical repair work will appreciate the features incorporated in this test bench. In the ground plan 1 shows a Westinghouse 2-hp. motor furnished for any commercial current, complete with starting device, marked 2. Arm 12 is fitted with an eccentric belt-tightening device 49. The chuck is a standard 3-in. universal type with two sets of jaws, which allow the driving of any sized shaft or gear up to 3½ in. in diameter. The jaw is mounted on a swinging arm, 12, so counterbalanced as to have a vertical movement of 10 in. This arm is fitted with a locking device, 13. Friction members 4 and 5 are connected through shifting fork 14 to shift driven wheel 5 to any speed up to 2600 r.p.m. in either direction. This is operated by the handwheel 15. Automatic clutch 16 prevents creeping of friction wheels and holds device at any set speed. The friction drive is fitted with a Norma thrust bearing, 17, and operated by handwheel 18. This provides for any pressure.

The electric tachometer, 26, driven by belt from the chuck driveshaft is a handy device. This instrument is connected to the indicating meter 29. Reversing switch 31 is mounted on the main base of the drive and operated by finger 32 attached to shifter fork 14. This reverse instrument, when rotation is reversed, allows a maximum length of scale on the indicating instrument which indicates at all times the revolutions per minute of the apparatus tested. This enables the workman to check and adjust regulators and cut-outs to the proper cut in speeds and also to know the minimum speed at which a magneto will deliver a sufficient spark to start an engine.



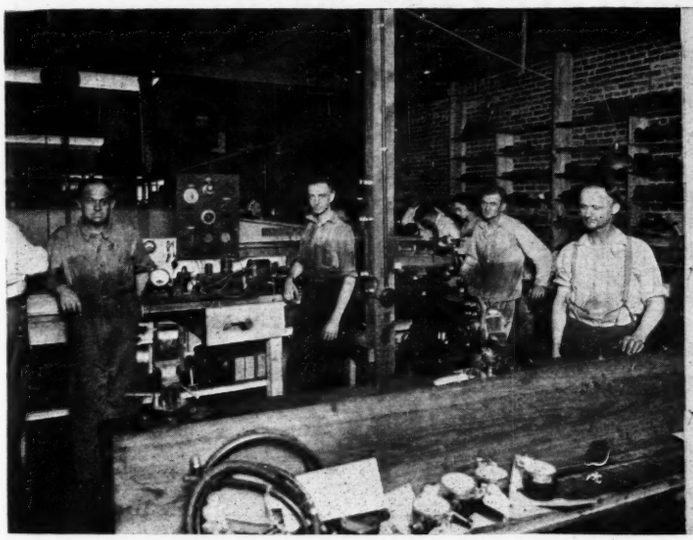
*Three-quarter view of the Cowie test bench for testing automotive electric equipment of all kinds*

**Holding Vise**

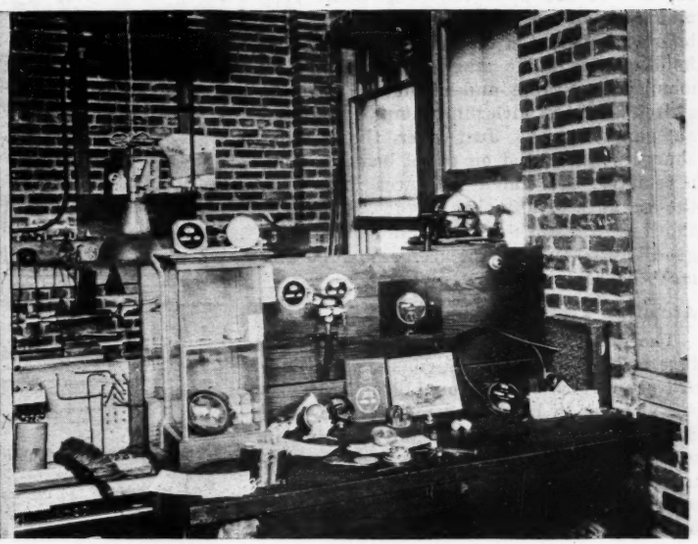
The holding vise will hold any make of generator, magneto or ignition apparatus. It is fitted with a locking device, 19, on screw, 20, with hand wheel, 21. A half turn of this completely opens or closes the vise, which is mounted on two parallel rods and can be moved forward or backward 8 in. This allows the apparatus to be brought in line with the driving chuck. The complete vise is mounted in bracket 23A bolted to bench, and held in line with driving chuck. This movable vise allows the driving of generators and ignition devices not fitted with suitable shafts for chucking. Several Delco machines can be driven by a screwdriver clamped in chuck. Again, where machines are fitted with couplings, same may be driven with a socket wrench held in chuck as the entire device is so made that after chucking and putting machine in line the complete apparatus can be locked in position and test made without any further attention to the driving device.

The magneto armature and ignition coil test block, 56, is fitted with cast-iron cradle, 57, connected to suitable gap points, 58, to connect and test any make magneto armature or ignition coil. The breaker, 59, is the standard Westinghouse vertical head which carries the cam and platinum points, mounted on block 50 to fit holding vise and so connected as to make all test of ignition coils either with or without condenser by the connection or disconnection of one

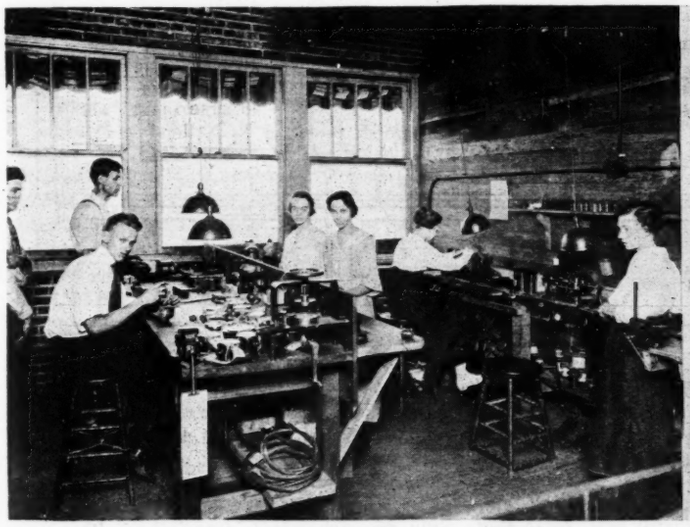
# Inside Cowie's Electric Service Station



This shows principally testing of magnetos



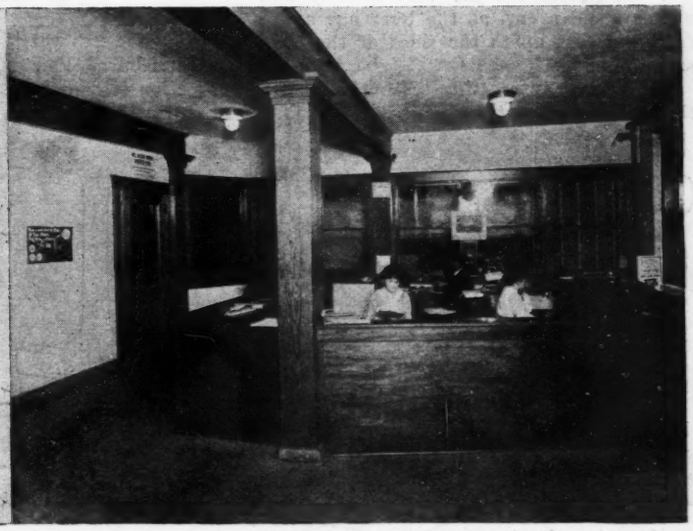
There is a corner for speedometer tests



Speedometer repairs and armature winding section

Where magneto armatures are wound

Dynamo armature winding—note women and boys



A glance in the office of the establishment

clip, 51, which connects or disconnects condenser 52. The adjustable spark gaps, 33, are of the approved three-point type mounted on satin-finished black walnut board, 34, mounted on panel board back of holding vise. The magnet charger, 35, is mounted on table and connected through switch 36 fitted with pilot lamp 37 mounted on panel board. Just over the magnet charger is mounted on panel board a magnetometer, 40, which indicates in pounds the strength of any size magnet. This will show at a glance whether the magnet is good and is suitable for use or no good and must be replaced.

**Armature Testing**

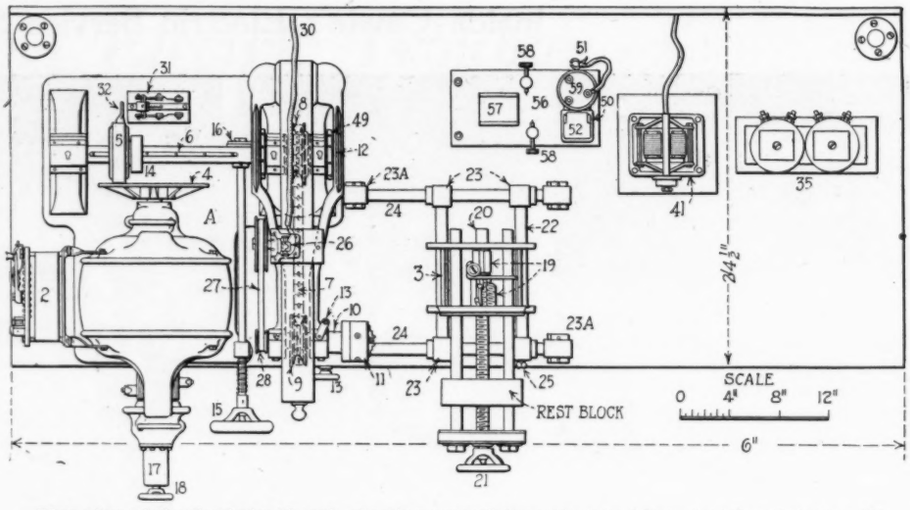
The generator and starting motor armature testing equipment 41 consists of standard growler to operate on 110 or 220 volts AC current to be used in connection with 2500 milliampere meter 43 and rheostat 43 mounted on panel that allows for the testing of any make of starting motor or generator armatures. A repairman can tell in 5 min. the exact nature and extent of all troubles armature windings are subject to.

The panel, in addition to the listed instruments, is equipped with voltmeter, 44, scale 30-0-30; ampere meter 50-0-50 45 for testing generators and 300 amperemeter, 46, for testing starting motors. The panel is equipped with suitable switches, binding posts and 12-volt Cowie storage battery 47, which enables you to make all the different combinations of connections for the testing of all kinds of automotive electrical equipments, including pilot lamp 48 mounted in nickel case fitted flush with panel complete with test leads for 110-volt test used for ground test.

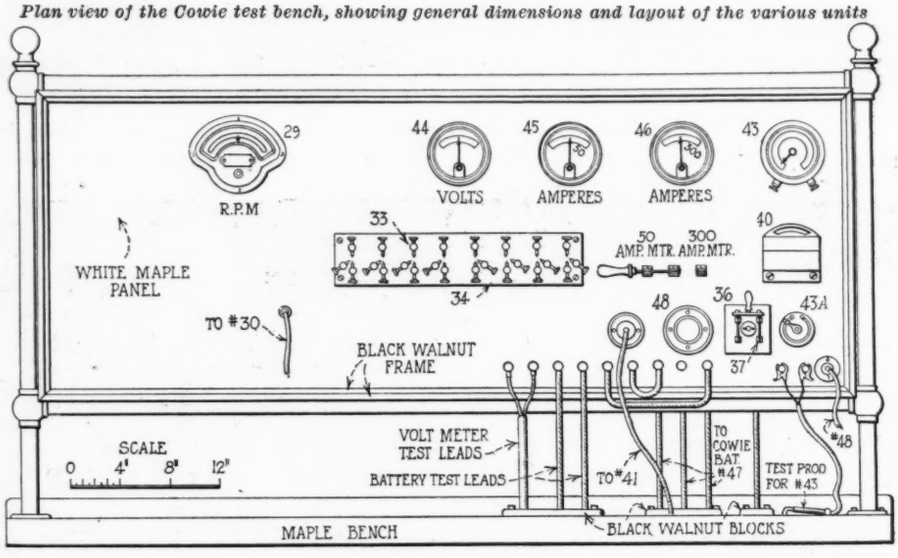
The complete job costs $1,000, but it is not necessary for a dealer to buy the whole outfit, for he can get only the wood bench, magneto, armature and coil-testing apparatus, magnet charger, driving device with vise, or any other part of the outfit he wants.

An adjustable armature stand is one of the shop-made devices noted in the Cowie establishment and pictured herewith. It is designed to handle all lengths of armature shafts and makes a rigid outfit. Undercutting mica on commutators is done with a dentist's burr held in the end of a chuck and rotated by a small electric motor. This does the job very quickly and makes a clean cut, as the burr has a flat face and cuts up to the sides of the commutator slots.

There is an interesting testing device in the battery department for testing jars.




*Plan view of the Cowie test bench, showing general dimensions and layout of the various units*



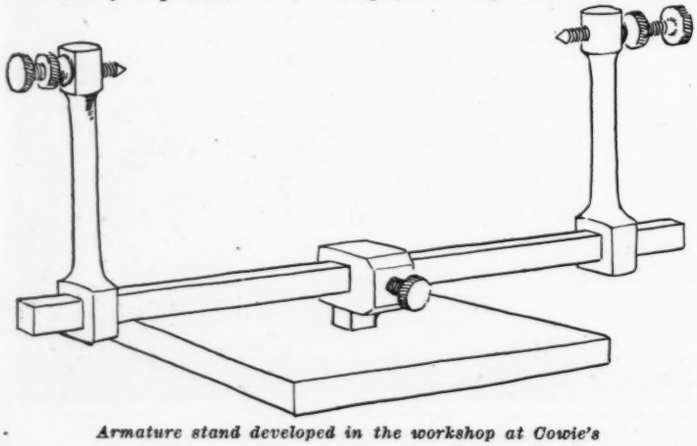

*Panel of the Cowie test bench, showing the locations of meters, spark gaps and connections*

The jar is slipped over a metallic holder after which a wire cage is slipped over the jar. The inside holder, as well as the wire cage, is connected to the high-tension winding of a powerful coil, so if the jar is leaky at any point the current jumps through and indicates a faulty jar. Small through and indicates a faulty jar.

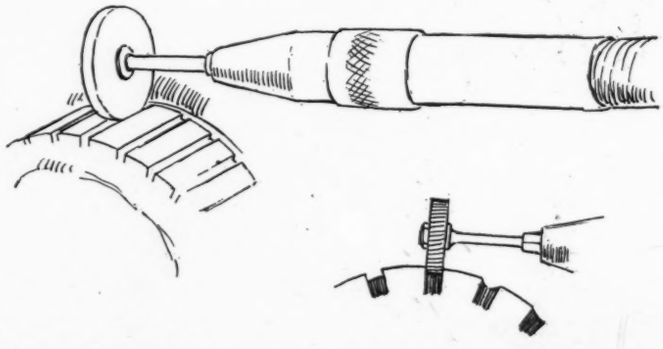
## TRUCK LENGTH LAW OFFERED

Harrisburg, Pa., March 14—Particular objection is expressed by dealer and owner organizations in this state against the bill regulating truck weights and widths fixing fees and making general motor car regulations. The bill proposes to fix truck lengths at 20 ft., and it is argued that 28 ft. would be more economical, especially in the case of moving vans, where the entire contents of an eight-room house, according to one truck distributer, could be moved in a 28-ft. truck as opposed to two 20-ft. trucks.

It also is urged by the truck interests that there be no separation of truck weights by chassis, body and load but that a maximum weight, say, of 28,000 lb., for the three combind, be set.



*Armature stand developed in the workshop at Cowie's*



*Application of dentist's burr for undercutting mica*

# The Wrong and Right Way to Sell Tractors

By Fred M. Loomis
*Motor Age Editorial Staff*

FRANK BLAKE is a farmer at Valley Falls, Kan. He works 320 acres. To help him he uses a 10-20 tractor which will handle three bottoms in the soil conditions he has. He finds also a tractor of this size gives him ample power for his belt requirements. He has no service troubles to speak of, because, he says, he bought a good tractor in the first place, takes good care of it and so far has been able to solve all his mechanical problems himself.

**Mechanical Sense Needed**

"You see, I happen to have a little bit of mechanical sense," he says. "That's something every farmer who owns a tractor ought to have, but it's something a whole lot of them haven't got. *I am inclined to think tractor troubles would almost disappear if the farmer would do two things. These are, in the order of their importance, purchase a tractor which isn't made of junk and learn how to run it and take care of it. I might say, too, get a machine which is fitted to the farm.*

"There's no trouble about running a good tractor if you know what you're doing, and if you don't know, then you ought to learn. The trouble is a whole lot of tractors have been sold to farmers which never ought to have been built in the first place and then they have been put into the hands of farmers who didn't know how to run them. Neither did the dealer, for that matter. Of course, there was trouble—there couldn't be anything else.

"The farmer ought to know what sort of a farm he has and what kind and size of tractor he needs to take care of his work. Then he wants to be a good picker and get the right machine and develop what mechanical sense the Lord has given him so that he can work it right. If he doesn't know these things he either ought not to have a tractor at all or he should take the advice of some dealer who does know what he ought to have."

**Right Kind of Co-Operation**

This is good, practical advice, and it means a whole lot to the tractor manufacturer, the tractor dealer and the tractor buyer. One reason why there has been so much trouble and dissatisfaction with the tractor business, why the manufacturer has kicked so hard about the service cost, why the dealer has been dissatisfied with the profit he has been able to make, why the farmer so often has failed to make economical use of his tractor, is because *there has not been the right kind of co-operation all down the line.*

The manufacturer has built his tractor along theoretical lines, frequently with too little regard for engineering and mechanical principles and with too little attention to the quality of materials and workmanship which went into his product. Likewise, he often has not given as much consideration as he ought to the practical needs of the farmer. His idea has been to build a tractor to sell, and talking points have loomed larger to him than has practical adaptation to farm needs.

Merchandising has been too often the thing before the eyes of the dealer, and it has filled so much of the range of his vision that some of the factors which should have influenced him largely have been obscured. He has too often been ignorant or indifferent to the sort of tractor he ought to sell. He has not understood his local conditions and he has not been apt in adapting a tractor to those conditions. He and his customers have not analyzed the individual need of each, and the result has been that a lot of misfitting has taken place.

Take a typical instance. A certain dealer in southern Wisconsin took the agency for a well-known tractor line. This dealer conceived the notion that one size of tractor, namely, one with a three- or four-bottom capacity, according to soil conditions, was the one he ought to push regardless. A farmer in that vicinity got it into his head in turn that he needed a tractor, and he went to this dealer to buy it. The dealer sold him one of the big machines, taking $500 as a payment, the agreement that the balance should be paid after the tractor had proved itself on the farm.

**A Bad Sale**

Just at present this particular case is in the courts because the farmer refused to pay the balance of the purchase price and the dealer sued him. Why? *The purchaser's farm contained only* 78 *acres, and the tractor the dealer sold him was entirely to large* and was impossibly uneconomic on a farm of that size. Maybe the farmer did not know any better. It is to be presumed that he did not, anyway, or else he never would have made such a foolish purchase. Maybe the dealer didn't know any better, either. Then again, maybe he did but was indifferent as to what the results might be just so he sold the tractor. There are dealers like that, you know. But the dealer ought to have known, and he never should have made the sale under any circumstances. In this case there was no excuse for the dealer, because there are two smaller tractors in the line which he represented, either one of which, admitting that a farmer with only 78 acres needs a tractor at all, would have come far nearer meeting the case.

There are dealers who go at this sort of thing differently. Take Dave Elder at Stanford, Neb., for instance. Dave is not alone a dealer. He is also farmer, and some farmer at that. This year he will plow at least 2000 acres on his own farm and something like 1000 acres additional for his neighbors. In his capacity as a farmer he operates a 30-60 Aultman-Taylor tractor, a 20-40 Case and a 12-20 Heider.

In his capacity as dealer last year he sold tractors and tractor equipment to a value of above $100,000. His percentage of expense for selling was about 10 per cent. The rate range of the tractors Dave sells is about the same as that of the machines he owns and operates himself. Maybe the fact that he is an experienced farmer and tractor operator first of all tells him what he ought to do when he sells. At any rate he does not in his selling settle arbitrarily on a certain size of tractor and then push that regardless. Oh, no, that's not Dave's method at all. Upon the contrary; *he fits the tractor to the job.*

**Tractor Fits Farm**

There are lots of big farms in his section. When one of the big farmers wants a tractor Dave sells him a 30-60. You see, Dave tells his customer, with the 30-60 you can pull ten bottoms and three tandem disk harrows and plow and harrow about 90 acres a day, and that's economy. The big machine is what you want.

But where the farmer has a piking little farm of only a half section or so Dave won't let him talk the big machine at all. He says, what you want is a 20-40 or a 22-45, that's big enough for you. And still smaller capacity machines find their way through Dave's hand onto farms which are smaller than a half section. To what an extent this light stuff figures in his annual sales may be surmised from the fact that he just has arranged for a credit line of $60,000 to handle this little stuff in 1919.

It happens that Dave belongs to the old school of dealers. He used to sell motor cars, but he quit them some time ago and went back exclusively into implements and power farm equipment. He has some methods in selling which are not approved modernly by good dealer society. For instance, he sells tractors on time. He admits that two years is about the limit of credit on some big outfits he sells. This is, of course, confined to the big machines, the smaller stuff being kept pretty well down to the ninety-day limit, but most of his sales have a time factor in them.

**Carries Repairs**

Dave says, however, that this doesn't worry him any because he makes his service his collection agent. He carries a stock of repairs and responds to calls for help promptly. His own experience as a farmer and tractor operator has taught him that when the farmer wants help he wants it P. D. Q., and Dave gives it that way. This much facilitates collections, says Dave, and takes the curse out of the time sales plan of handling tractors. *Keeping the customer always satisfied because his tractor continuously is at work when he wants it to be, and seeing to it in the very beginning that the tractor is fitted to the job will put almost any tractor business across successfully, irrespective of some more or less reprehensible methods of selling.*

# Garage Planning
## Service Station Arrangements

### No. 23

Q —PRINT sketch of garage 140 by 140 ft., showroom and office.—Neodesha Motor Co. Neodesha, Kan.

Lacking details as to what you want, we have been forced to draw a plan which would suit the average dealer, and so the chances are that it will be satisfactory for you. If you find, however, that you wanted a larger shop, a showroom for tractors or one or many other features, we shall be very glad to draw a new plan for you.

You did not state whether your building is on a corner or not, so please note that our plan is equally suitable for a corner or inside location.

The arrangement of the cars has been planned for maximum economy of space as well as convenience. Row C has no direct communication with the aisles, but if you take pains to see that the cars in rows B and D are ones which usually come in late and leave early, the cars in these rows will be quite out of the way when the cars in row C are required, since these cars should be ones which usually leave late and come in early.

Access to the shop is through a series of sliding doors, and it is planned that the cars in row A usually will be out of the garage during the daytime, so that direct access by car to any portion of the shop is possible.

The arrangement of showroom and offices is compact and convenient. The various rooms not having windows may be illuminated and ventilated by skylights.

You sell accessories, and therefore you should have a store. If you have any doubts on this point, please let us know and we will give you all the reasons.

The shop includes rooms for vulcanizing and electrical work, tool equipment, a room for tools and parts and a men's lavatory.

The four walls of the building are completely filled with windows. Do not eliminate any more windows than necessary. Plenty of light brings business and is more than worth the extra coal required to keep a building with plenty of windows warm. In the interests of maximum light and ventilation it is also advisable to have a large skylight in the center of the garage space, and if windows must be eliminated due to adjacent buildings, still more skylights should be used.

### No. 24

Q —We are about to erect a salesroom and service station on a lot with a frontage of 50 ft. and depth of 120 ft. We would like to have plans to fit the above space.—Charleston Buick Co., Charleston, W. Va.

Herewith is a plan which should meet the needs of the average dealer who builds on a plot this size. You have given so few details regarding what you want it is possible we have omitted some special features which you may desire. This is because our design fits an average case. If for this reason the plan does not suit, we shall be glad to lay out another for you.

There is no way of telling whether your plot is on a corner or not, and so the plan has been drawn so that it is equally suitable for corner or inside location. If it is on a corner, you will likely desire a side entrance to the garage and shop, and this, of course, should open into the aisle.

If your plot is on a corner and you feel there is not sufficient space for showroom, store or offices, you might eliminate the front driveway and expand the front departments so they will cover the whole frontage. At the same time it is well to preserve the general layout laid down.

The general and private offices receive light and ventilation from the showroom, but in addition it is very advisable to have skylights in these rooms.

You will find the car arrangement suggested quite satisfactory. There are two rows of cars on one side of the aisle and one row on the other. To the rear of this row is the shop, any part of which is instantly accessible through a series of sliding doors. At first sight there may seem to be some objections to this arrangement. You may wonder how cars in row C can be got out without disturbing those in row B. The solution of this is easy. Cars in row B are those which go out early and those in row C those which go out late. Cars in row A may be those whose movement is uncertain. At the same time there will always be enough vacancies in row A in the daytime so it will be no trouble to get cars in and out of the shop.

The washrack is 15 ft. wide and has a thin partition on the third side, the front being open. Thus the space is practically inclosed so that adjacent cars will not be splattered. The width of the space is such that two cars can be stored when it is not being used for washing purposes.

**MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquirers are urged in asking for such plans to be sure to include the following information:**

**Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.**

**What departments are to be operated and how large it is expected they will be.**

**Number of cars on the sales floor.**

**Number of cars it is expected to garage.**

**Number of men employed in repairshop.**

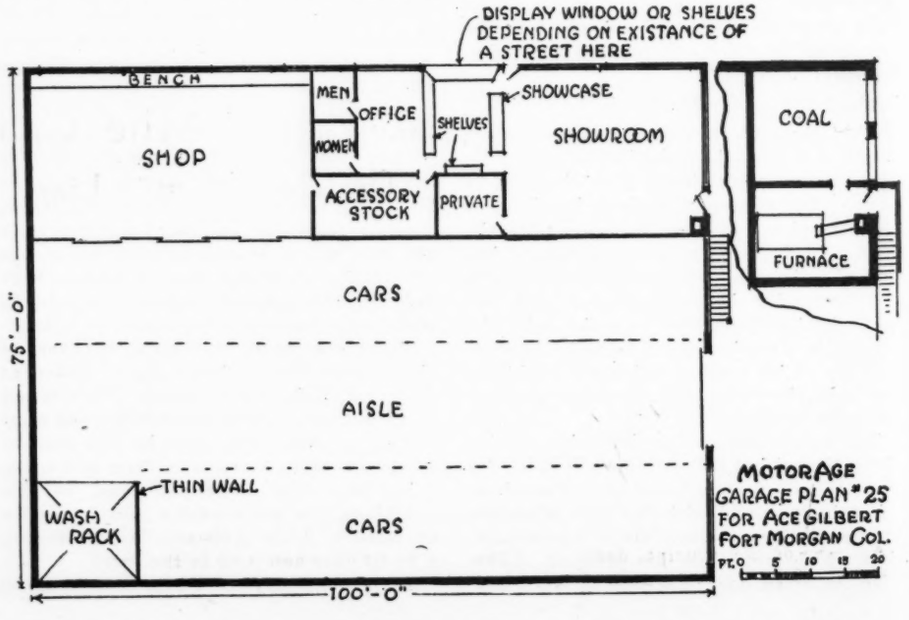
**And how much of an accessory department is anticipated.**

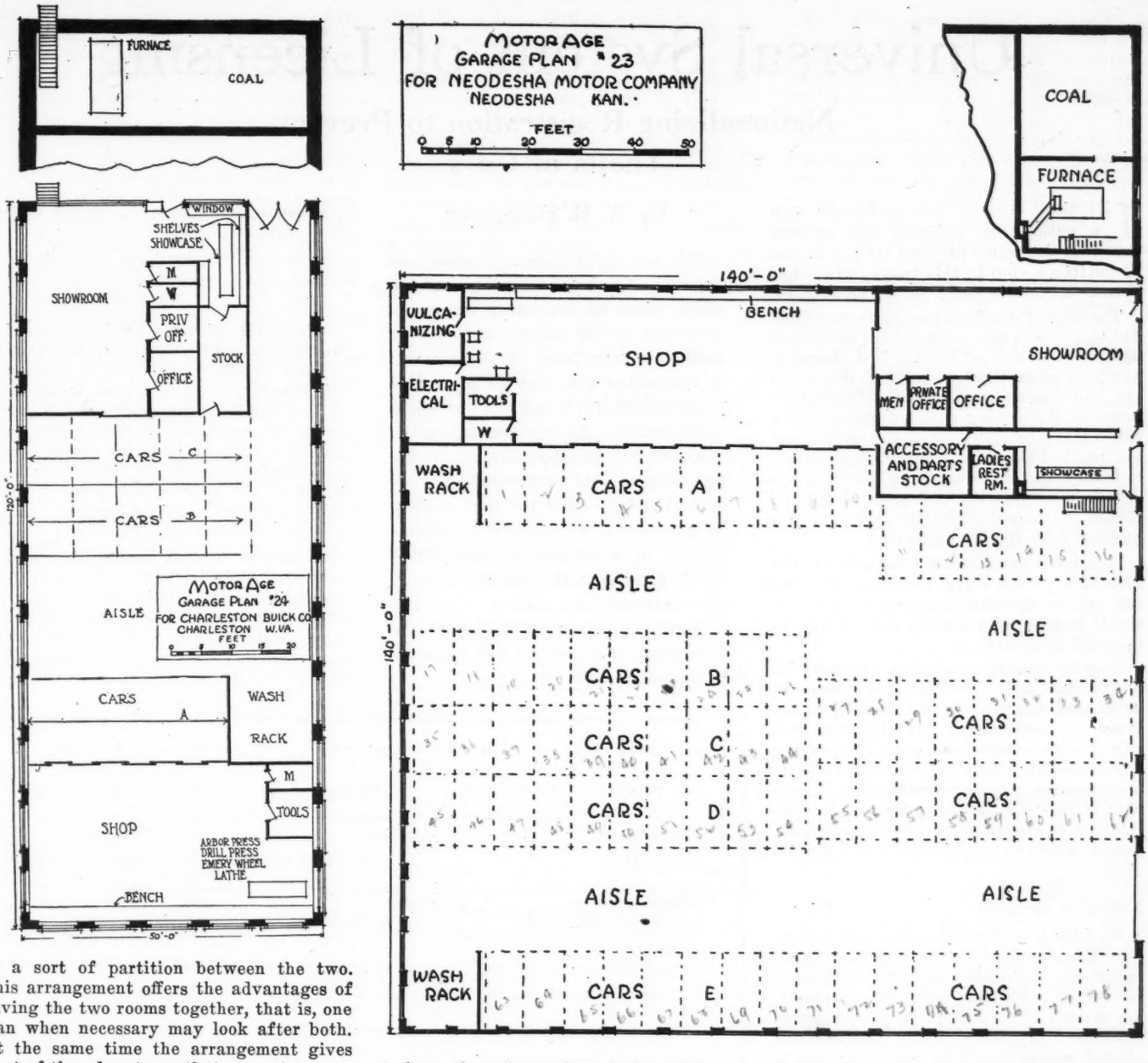
### No. 25

Q —Please lay out a garage plan for a plot 75 by 100 ft.—Ace Gillett, Fort Morgan, Col.

Herewith is a plan for a complete plant, showroom, office, store, garage and shop. It happens that this plan is a little more suitable for a corner location than it is for an inside one, although it is quite good for both. You have not stated which type of lot you have, so the plan has been drawn to fit both.

The accessory store—we assume you want an accessory store for the same up-to-date reasons you want a showroom—is in an alcove off the showroom, a showcase acting






as a sort of partition between the two. This arrangement offers the advantages of having the two rooms together, that is, one man when necessary may look after both. At the same time the arrangement gives most of the advantages that separate rooms offer.

This isolation of the accessory store improves the appearance of both showroom and accessory store, as the two do not look well combined. Also the isolation tends to keep the noise and confusion of the accessory department away from salesmen and prospects, although, of course, they are more likely to be distracted than if the rooms are entirely separate. To sum the matter up honestly, most dealers would do better to have these two departments in entirely separate rooms, but the average man still feels he must have the two more or less together, and in deference to this feeling the store has been placed as an alcove to the showroom.

# The Law in the Case

## The Repairman's Lien

THE life of the repairman may appear as a bed of roses to the person on the side lines, but if said person ever gets nearer than the side lines he will proclaim himself several kinds of an idiot for so thinking.

For, we have it upon the honor of one who knows, the repairman's life, while pleasant at times, has its unmistakable and positive drawbacks at others. Because of this we are informed repairmen have been known to advise their budding offspring to go in for the ministry, take up flying or, well, most any old thing but to leave the doctoring of flivvers and twin-sixes to others.

And one of the principal drawbacks, and a source of premature gray in the head of the repairman, is caused by the operation of "repair pirates." By these we mean fellows—we are not going to call them men, unless forced to by the editor—who make it a practice to get work done, then remove their cars before the work has been paid for.

Now, the laws of the various states are not uniform in regard to the repairman's lien, but most of them provide a lien of some form. Also in many of the states this lien is destroyed by the removal of the machine from the possession of the repairman. And where this is the case you may wager your grandmother's last pillow cushion every dead-beat in that state knows of it.

Take for example New York and Indiana. As we recall, both have excellent lien laws applicable to repairmen and if the workman simply will stand pat after doing the work, he will have to be paid before the owner or anyone else can remove the car upon which the work has been done. But in both these states the moment he releases the car the lien is dead, and if afterward the "cus" will not pay, all that is left for the repairman is a suit on account or an action for work and labor. Very poor remedies, especially in a state like Indiana, with a $600.00 exemption law in force.

(*Concluded on page* 46)

# Universal System of Licensing

## Nationalizing Registration to Prevent Thefts of Cars

By W. B. Humphrey

**The subject of Federal licenses and license plates supplanting those of the states crops up frequently and probably will be the subject of a bill in Congress before long. The suggestion in this article that they be so used as to prevent thefts is new and one worth consideration. An improvement on the plan outlined here possibly would consist in the method advocated by MOTOR AGE for years—that the license plate be permanent, with simply an annual change in a detachable disk which would show that the fee for the current year had been paid.**

**Here is a movement worthy of the consideration of dealers and trade organizations.—Editor's Note.**

THE theft of motor cars has become such a nation-wide nuisance and expense that it is time some national laws or means of putting a stop to this traffic, which has become a business itself, should be adopted.

The idea of a person having to pay from $10 to $100 a year insurance for protection against the theft of his car is a shame to the lack of method or laws of this country, and also an unnecessary additional expense to the owning and maintaining of a car. It is conceded that the motor car has reached the stage where it is no longer a luxury but a necessity to the progress of the country, rich and poor alike, and should be recognized by the Government's passing laws for its protection.

It is not a question only of costs but the idea of a person being afraid to leave his car out on the street unless it is "hog-tied" in some way and be sure it will be there 15 min. later.

It is my candid opinion that no mechanical invention or contrivance will ever be made that can prevent the stealing of automobiles, consequently, the only other remedy is some system and laws for proving ownership, also some very drastic national laws against these criminals when caught with these stolen goods, and especially joy-riders who are let out so easily by lenient judges, which encourages more of this business.

### Authority for Plan

My idea is to have the state legislatures give Congress authority or power to establish and maintain a national, or central, bureau for the issuing of licenses and keeping records of all cars made and of stolen machines. It readily can be seen that one central bureau would be less expensive to maintain, more accurate to keep up, at a considerable saving of time in handling compared to forty-eight different bureaus as are now issuing licenses.

Each and every manufacturer of cars would be required to send to this central bureau a daily report of the machines shipped from their factory, the party shipped to and shipping point, with the numbers of the engine, chassis and body. The bureau would keep a card index record of each engine, chassis and body for each different make of machine as reported to them by these manufacturers. Also a cross index record would be kept for the engine, chassis and body, so that if you knew the number of the body you easily could find the engine number or vice versa. These cards would have a place left blank for the license number, owner's name and address, date, and would be a complete record of the machine, and would be something like the illustration.

Each different make of car would have the name of car on the license tag or plate, and the engine number and the license number would be the same, with the year the license was isued for, on the opposite end of the tag, as:

DODGE
40167
1918

Also each different make of machine would have a different-shaped tag, or plate, so that an officer could tell at a glance if the license was for the right make of car or if it had been changed to match another make of machine with the same engine number. By looking at the engine number and comparing with the license number it would be the same unless license numbers were switched or the engine number changed or tampered with.

A different-colored license tag would be used each year to be able to see that the license was up-to-date in case the year was not readily seen. The licenses would always be the same shape for a certain make car, only the color and year changing. This license should be of a size fixed by law

| Make | Type | Engine No. | Chassis No. | Body No. |
|---|---|---|---|---|
| FORD | RUNABOUT | 618734 | 526769 | 432136 |

| Shipped to | Location | Date |
|---|---|---|
| JOHN DOE | ST. PAUL, MINN. | MAY 5, 1917 |

| License Issued to | Location | Number |
|---|---|---|
| JOHN BROWN | ST. PAUL, MINN. | 618734-1918 |
| | | |
| | | |
| | | |
| | | |
| | | |

See Reverse Side for Notations

JOHN BROWN

100 Robert St., St. Paul, Minn.

Applies for License on the Following Described Car

| Make | Type | Engine No. | Chassis No. | Body No. |
|---|---|---|---|---|
| FORD | RUNABOUT | 618734 | 526769 | 432136 |

| Shipped to | Date | Year Made | Last License Issued to—Year |
|---|---|---|---|
| JOHN DOE, St. Paul, Minn. | May 10-18 | 1917 | JOHN DOE St. Paul, Minn. 618734—1917 |

Remarks

Suggestion for card index record of cars, showing both sides

and put only in a certain place on each car, one in the rear and one in the front.

The engine, chassis and body numbers should be put in a certain prominent and easily-seen place, this place to be determined and fixed by law and the numbers to be of uniform size and shape and put on in such a way that it would be impossible to remove or change them without it being readily seen that they had been changed. For instance, the number should be cast on the cylinders or put on a plate and the plate put into the mold and cast with the cylinder so that it could not be removed without showing it.

The party applying for a license would be required to make application to the sheriff at the county seat, or the chief of police in large towns, in person and take the machine along for inspection, also a friend to prove ownership.

The sheriff or chief of police would be obliged by law to take the number of the engine, chassis and body of the car and inspect same to see if the numbers had been tampered with or not and to send in the application for the license to the central bureau. The central bureau could send the license and tags direct to the owner in case there was no question of ownership. Of course, each of these sheriffs or chiefs of police would be kept posted on the numbers and descriptions of stolen cars by the central bureau and would be on the look-out for them, and when a person applied for a license, they would know by comparing the numbers with their lists if the car were stolen or not. Also each of these sheriffs and chiefs of police would be required to notify, within a specified time, the central bureau of all stolen cars with complete description, and numbers.

In case the sheriffs or chiefs of police found that the car was stolen or that the numbers had been tampered with and the applicant could not prove his ownership satisfactorily, the car with description would be advertised in the daily papers a certain number of times as a stolen article and if the car was not claimed by owner in a specified time, the car would revert to the state and be sold at auction.

**Would Examine Cars**

The state would have an auctioneer and board of examiners whose duty would be to examine the car and put a notice on same giving its value and condition so that the public would have a fair chance to buy these cars at a fair price.

The auctioneer would also put a tag on the engine with the correct number, with the state seal, and give the purchaser a document of sale so he could prove his ownership, and the tag would show that it was a stolen article sold by the state at auction. Also the purchaser of one of these cars would be compelled by law to carry this document along with him to show whenever questioned as to ownership.

If the car was proved to be owned by the applicant for a license, the sheriff or chief of police would send in his application with the previous year's license number, if it was not a new car, to the central bureau.

The central bureau would refer to their records, and if they found that the description did not tally with their records they would notify the chief of police or sheriff, who would investigate its ownership.

The cost of maintaining this central bureau would not be 1 per cent of the cost of insurance for theft, besides doing away with the license offices in each state, and could be deducted from the license fee, the balance of the fee going to the state that sent in the application.

The license fee then would be uniform in price and could be made to just cover expenses if necessary, or the owners would be glad to pay a higher license fee for this protection and added peace of mind, the added fee to be used for building of roads only.

Each car would have the same license even if moved from state to state, which would cut down the number of licenses and tags issued.

The sheriffs and chiefs of police would be more than repaid for the extra trouble and work by reducing the thefts to a minimum compared with the long lists of stolen cars they now are compelled to try and find with small chance of success.

## 18,270 STUDEBAKERS IN 1918

South Bend, Ind., March 17—Commercial operations of the Studebaker Corp. in 1918 were curtailed on account of the Government's need of a large part of its facilities and restrictions on iron and steel. This permitted the corporation to manufacture only 18,270 cars and 58,830 horse-drawn vehicles, about 50 per cent of the latter type being delivered on war contracts. However, in general, the eighth annual report shows an increase in earnings for 1918, a strengthened financial position and plans for important increases in facilites. Net earnings amounted to 10.39 per cent on common, as compared to 9.11 per cent in 1917.

Net profits amounted to $4,521,997, and the concern paid $637,752.97 in income and excess profits taxes. The plant and property account increased to $2,440,889.80 during the year, this including the new buildings and additional machinery in the Detroit and South Bend plants. Regular dividends were paid at the rate of 7 per cent of the preferred and 4 per cent on the common and amounted to $1,967,550. Also $1,916,644.50 was transferred to the surplus, making this $19,771,375.14 at the end of the year.

From a commercial standpoint the war orders entered into by Studebaker did not prove attractive, as they netted only 4.8 per cent on sales. A contract from the Ordnance Department called for 4000 155-mm. shells a day and allowed for increased plant facilities amounting to $4,250,000. Extensions were made and machinery was installed preparatory to production and when the armistice was signed the concern was making at Detroit gun carriages and other war supplies and South Bend artillery wheels, road track links for tanks, wagons and harness. The contracts were canceled the last of the year, and the corporation has claims of $8,200,000 against the British and United States governments, which it expects to collect in full.

Altogether the company received orders for $55,078,353 domestic and foreign government business during the war.

The corporation bought $5,000,000 worth of Liberty bonds in addition to the $3,000,000 worth bought by its employees.

About a third of the new plant, details of which were given in a previous issue, will be completed by the end of this year and by February, 1920, the company expects to be producing 3000 cars a month. About 6500 cars will be produced the first quarter of this year and 4000 a month thereafter.

Everything considered, the report states, the business of this year promises to be very satisfactory, probably better than any year since 1916. The report covers the business of the subsidiary companies of the corporation, which are the Studebaker Corp. of America; Studebaker Harness Co., South Bend; Studebaker Corp. of Canada, Ltd.; Studebaker Bros. Co. of California, and Studebaker Bros. Co. of Utah.

## NATIONAL 1918 SALES

Indianapolis, Ind., March 15—Net sales made by the National Motor Car & Vehicle Corp. in 1918 amounted to $2,880,757, and the gross profit was $484,964. During the year the company had Government contracts for $10,340,000, of which about half were canceled after the armistice was signed.

## CHANDLER $31 A SHARE

Cleveland, Ohio, March 14—Net earnings of the Chandler Motor Car Co., for 1918 were equivalent to $31.35 a share, as compared with $34 a share in 1917, before Federal taxes are deducted. After allowance for taxes the net earnings are expected to show about $21 a share. Net earnings before deductions for taxes amounted to $2,194,618.20, of which amount only $67,500 was earned from war work.

The following officers have been re-elected: President, F. C. Chandler; vice-president, C. A. Emise; treasurer, Samuel Regar; secretary, Isadore Grossman. W. S. M. Mead was elected second vice-president.

## RADIATOR HOLDER

Chicago, March 17—The Cresco Auto Repair Co., whose radiator holder was described in a recent issue of MOTOR AGE, is located at Cresco, Iowa, and not Cresco, Ohio, as it appeared.

## TO MAKE CUSTOM BODIES

Cleveland, Ohio, March 14—The Baker R. & L. Co. has entered the custom body field. Several years ago this company established a special body department but until recently has confined its efforts to special designs for manufacturers and dealers, the individual custom work not being solicited. Facilities have been expanded, and the company is producing original designs to meet the wishes of individual owners.

The company has changed the name of its R. & L. car to Raulang electric. The change is expected to meet with the approval of both the dealers and the public.

# Electrical Equipment of the Motor Car

By David Penn Moreton & Darwin S. Hatch.

*Editor's Note—Herewith is presented the 138th installment of a weekly series of articles begun in* MOTOR AGE, *issue of June 29, 1916, designed to give the repairman and motorist the knowledge which will enable them to care for and repair any and all of the electrical features of the car, no matter what make or model it may be.*

*The first half of this series has been published in book form by the U. P. C. Book Co., Inc., 243-249 West Thirty-ninth street, New York, and is sold at $2.50. The remainder of the series will be published as a supplementary volume.*

## Part CXXXVIII—Remy Special

THE Remy apparatus used on the Moline Universal D tractor consists of the governor-generator, control box, ignition distributer and the starting motor.

The generator, Fig. 696A, 696B and 696C, is four-pole shunt-wound. The armature, A, is assembled on a steel shaft on which laminated core is built up, then the coils of insulated wire are wound on it, and their ends are soldered to the bars of the commutator, B. A gear is used on one end of the shaft, C, which engages with the camshaft gear and the ratio is such that the armature is driven one and a half revolutions for each revolution of the engine crankshaft.

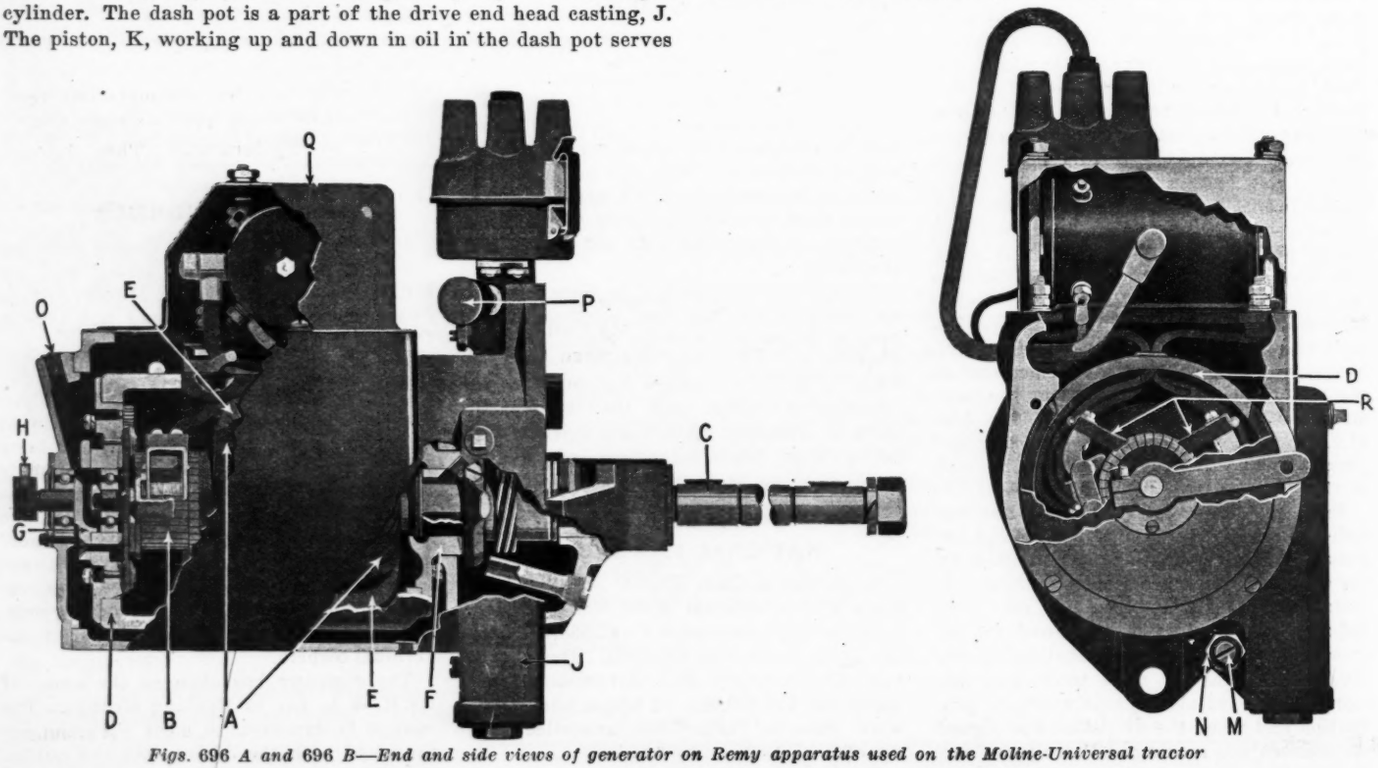
The field frame, D, which has four poles around which the four field coils, E, are placed, is supported at the drive end by a bearing on armature shaft in casting, F. It is supported at the commutator end by the ball-bearing supporting the forging, G. This field frame is free to turn through an arc of 30 deg. The control lever, H, is attached to shaft of G and is linked to the carbureter throttle, which it moves as the generator field frame D turns.

A spring, I, is provided, which tends to turn the field frame in a direction opposite to the armature rotation. This governor spring is located in a cylinder in the generator housing, which serves the double purpose of inclosing the spring and a dash pot cylinder. The dash pot is a part of the drive end head casting, J. The piston, K, working up and down in oil in the dash pot serves to prevent the too rapid fluctuation of the field frame to which it is linked.

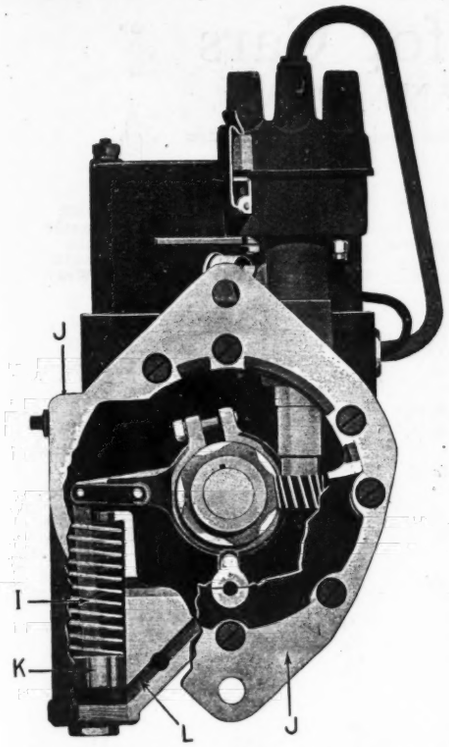
The field rheostat which is in the control box is a resistance unit. It is composed of a length of German silver wire with ten contacts so arranged that connection may be made to any contact by a movable contact arm. The contact arm is carried on a shaft which is extended through the face of the control box and to which is attached the rheostat hand wheel affording a convenient method of controlling the contact arm. The ten positions of the hand wheel shown on the face of the control box indicate the ten steps of resistance in the rheostat.

Position No. 1 gives a governed engine speed of approximately 400 r.p.m., while position No. 10 gives a governed engine speed of approximately 18 r.p.m.

Any engine speed attained by placing the controller on a given position will be maintained because if the engine speeds up, due to a decrease in load, the magnetic pull of the field on the armature is increased, causing the field frame to turn and close the throttle. But if the engine slows down due to an increase in load, the magnetic drag of the field on armature is decreased, allowing the field frame to be turned by the spring in the direction opposite to armature rotation, opening the throttle.




*Figs. 696 A and 696 B—End and side views of generator on Remy apparatus used on the Moline-Universal tractor*



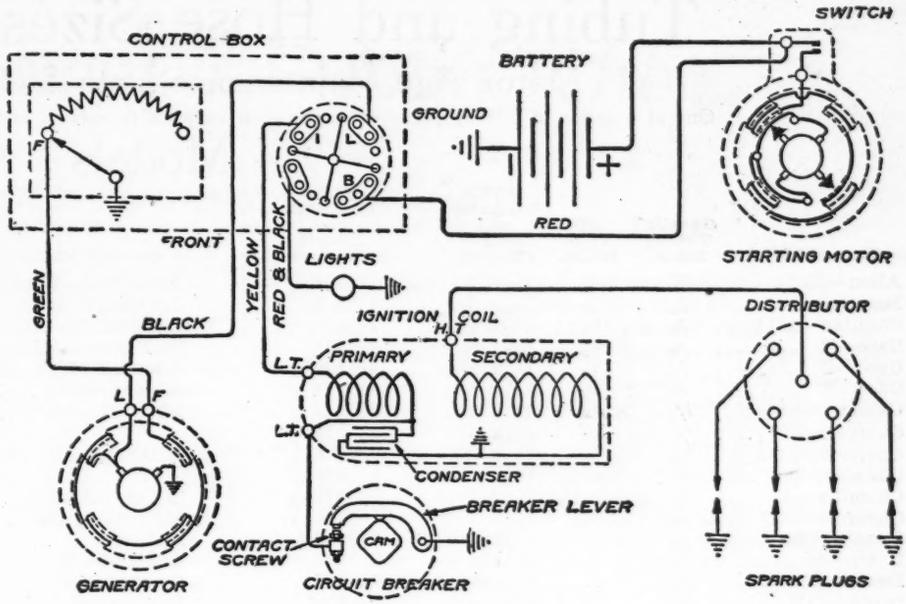




*Fig. 696 D, above—Wiring diagram of Remy installation on Moline-Universal tractor*

*Fig. 696 C, left—Another view of the generator used in Remy tractor apparatus, showing governor spring*

The oil dash pot and piston prevent the spring from opening the throttle too quickly. The dash pot is exposed to the oil of the engine case, and, therefore, needs no attention.

When the throttle is opened, the oil is forced by the piston from the dash pot through a by-pass, L. The size is controlled by an adjustable screw, M, with locknut.

To adjust dash pot by-pass valve, loosen lock-nut, turn screw M to left four turns, place controller on position 8, then change quickly to position 1. If governor fluctuates up and down turn screw to right until fluctuation is eliminated.

Do not adjust until engine is warm and carbureter is known to be all right.

To oil the governor generator, put four drops of 3-in-1 or cream separator oil in ball oil hole, O, twice a week. Turn down grease cup two turns a week. Too much oil or grease is bad. Do not use gas engine or farm machinery oil on electrical apparatus.

A removable dust-tight cover, Q, at the top of the generator case provides access to the commutator and brushes. Inspection of brushes, R, and commutator, B, for dirt should be made twice a season. The commutator wears naturally to a brownish color in normal use, but if it appears black or scored, the surface should be smoothed with a piece of fine No. 00 sandpaper. Never use emery cloth for this. Blow out all dust and clean out all dust between commutator bars. See that the brushes swing freely on their pivots, so that the spring tension holds them in good contact with the commutator.

To produce a spark at the spark plug, it is necessary to close and open the battery circuit through the ignition coil each time, and this action is accomplished by the circuit breaker. The circuit breaker has two contact points, one, the contact screw for adjusting the breaker point opening, being stationary, while the other is carried at the free end of a pivoted arm called the breaker lever. The four-faced rotating steel piece, called the cam, has accurately ground corners which bear against the fiber block in arm, as cam turns, and cause the contact points to open and close at the proper time.

To adjust contact points, turn engine until contact points are wide open. The gap should then be 0.020 to 0.025-in., or the thickness of the gage on the side of wrench furnished for adjusting the contact point opening. If found to be worn unevenly or dirty, these may be cleaned by passing between them a fine flat file, or preferably a piece of No. 00 sandpaper. Do not use emery cloth.

Adjustment of the gap between the contacts is made by loosening the lock nut next to the post, with the wrench furnished, turning the adjusting screw then locking the nut again. Do not oil these contact points. Every week, however, a slight trace of vaseline placed on the fiber block or on the cam will keep the cam from rusting and wearing fiber block.

## Starting Motor

The starting motor is of the four-pole, series-wound type with Bendix drive. The position of the rocker-ring, upon which the brushes are mounted, should never be changed, as the ring is accurately set at the factory.

## Maintenance and Operation

Do not crank tractor by hand with the spark advanced.

Keep out dirt when adjusting breaker points.

Avoid excess lubrication on breaker box—oil or carbon on the breaker points will prevent a spark.

Do not play with the generator. It is thoroughly tested and its adjustment should not be changed.

If trouble is experienced, such as weak lights, sluggish starter or poor ignition, examine all terminals to see that they are tight and clean, especially the storage battery terminals. They should be kept free from all corrosion.

Do not remove the ignition distributer from the governor generator housing, unless necessary, because it will change the timing.

Do not change the ignition timing, unless it is absolutely necessary, due to having removed the ignition distributer or governor-generator from the engine.

Do not hold the carbureter throttle open and cause the engine to race when the control is on a low point, as the field will then be strong, permitting the voltage and output to run up very high and possibly burn the rheostat resistance in two. Then there would be no control of the engine speed, as the field circuit would be open and no current could be generated to operate the governor.

Under proper conditions, the engine should start after 1 to 3 sec. cranking. If it does not start after 10 to 15 sec. cranking, there is something wrong. Investigate before cranking further or the battery will soon become discharged.

If the starter fails to crank the engine, do not blame the starter, ignition or the carbureter, but proceed as follows:

1—See that the battery terminals are clean and that all connections in the starting circuit are tight, especially the starter lead where it is soldered into the terminal that connects it to the battery. If you are able to twist the wire in the terminal, it should be re-soldered.

# Tubing and Hose Sizes for Cars

## Motor Age Maintenance Data Sheet No. 30

One of a series of weekly pages of information valuable to service man and dealer—Save this page

## 1914 Models

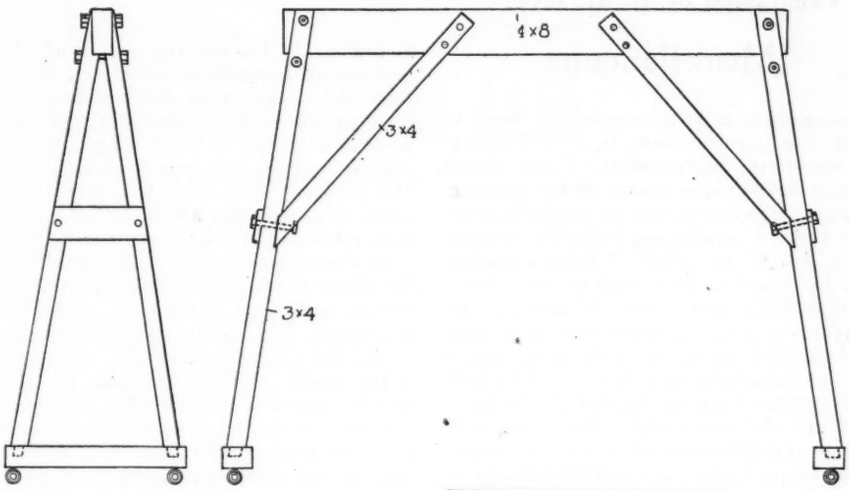
| Car and Model— | Gasoline Tubing Diam. | Oil Tube Diam. | HOSE Diameter and Length (Upper) | HOSE Diameter and Length (Lower) |
|---|---|---|---|---|
| Allen—38-40 | 3/8 | 5/16 | 2 1/4 x 8 | 1 1/2 x 6 1/2 |
| Briscoe—B-15 | 5/16 | 5/16 | 1 1/2 x 5 | 1 1/2 x 8 |
| Cadillac—1914 | 5/16 | 1/4 | 1 1/2 x 7 1/4 | 1 3/8 x 10 |
| Case—R | 5/16 | 3/8 | 1 5/16 x 5 | 1 5/16 x 18 |
| Case—O | 5/16 | 3/8 | 1 1/4 x 5 3/8 | 1 1/4 x 12 1/2 |
| Case—S | 5/16 | 3/8 | 1 1/4 x 5 3/8 | 1 1/4 x 14 1/2 |
| Chalmers—19 | 3/8 | 3/8 | 1 3/4 x 4 3/4 | 1 1/2 x 18 5/16 |
| Chalmers—24 | 3/8 | 3/8 | 1 3/4 x 6 1/4 | 1 1/2 x 14 |
| Chalmers—26A | 3/8 | 3/8 | 2 1/2 x 3 | 2 1/4 x 3 1/2 |
| Chandler—15 | 5/16 | 1/4 & 1/2 | 1 3/8 x 8 1/2 | 1 3/8 x 13 1/4 |
| Chandler—16 | 5/16 | 1/4 & 1/2 | 1 3/8 x 8 1/2 | 1 3/8 x 11 1/4 |
| Chevrolet—H | 5/16 | 3/8 | 1 3/4 x 7 | 1 3/4 x 4 1/2 |
| Cunningham | 5/16 | 1/4 | 1 1/4 x 5 1/2 | 1 1/4 x 3 3/8 |
| Davis—35 | 5/16 | .. | 2 x10 | 2 x12 |
| Davis—6-50 | 5/16 | .. | 1 1/2 x10 | 1 1/2 x12 |
| Dodge—All | 5/16 | 3/8 | 1 3/4 x 6 1/2 | 1 7/16 x 6 7/8 |
| Dorris—I | 5/16 | 3/8-5/16-1/4 | 1 1/4 x 3 1/2 | None |
| Ford | 1/4 | 3/8 | 2 x 3 1/2 | 1 3/4 x 2 3/4 |
| Franklin—All | 3/8 | 1/4 | None | None |
| Haynes—26-27-28. | .. | .. | ..... | 1 1/4 x 1 3/4 To Pump. |
| Haynes—26-27-28. | .. | .. | ..... | 1 1/2 x 4 1/2 To Radiator. |
| Haynes—26-27-28. | .. | .. | ..... | 1 1/2 x 7 Manifold to Rad. |
| Hudson—40 | 3/8 | 1/4 | 1 1/2 x 6 3/4 | 1 1/4 x 6 3/4 |
| Hudson—54 | 3/8 | 5/16 | 1 1/2 x 3 1/4 | 1 1/2 x 11 1/4 |
| Hupmobile—32HA | 1/4 | 5/8 | 2 1/2 x 8 | 1 1/8 x {13R / 15 1/4 L} |
| Inter-State—45 | 5/16 | 3/8 | 1 1/4 x 10 | 1 1/4 x 8 1/2 |
| Jackson—All | 1/4 | 3/8 | 1 1/2 x 12 | 1 1/2 x 12 |
| Jeffery—93 | 5/16 | 5/16 | 1 1/4 x 8 1/4 | 1 1/4 x 6 1/4 |
| Jeffery—96 | 5/16 | 5/16 | 1 1/4 x 6 1/4 | 1 1/4 x 6 1/4 |
| KisselKar—F-14 | 5/16 | 1/4 | 1 1/2 x 10 | 1 1/2 x 8 1/2 |
| KisselKar—H-14 | 5/16 | 1/4 | 1 1/2 x 9 | 1 1/2 x 9 |
| Lexington—4-H | 5/16 | .. | 1 1/4 x 14 1/2 | 1 1/4 x 14 1/2 |
| Locomobile—All | 3/8 | 1/2 | 1 25/32 x 8 | 1 25/32 x 8 |
| McFarlan—All | 5/16 | 5/16 | 1 7/8 x 8 | 1 1/4 x 6 |
| Maxwell | .. | .. | ..... | ..... |
| Mercer—35 | 5/16 & 1/4 | 5/16 & 3/8 | 1 1/4 x 9 | 1 x13 |
| Mitchell—All | 1/4 & 3/8 | 1/4 & 3/8 | 1 3/4 x 9 1/2 | 1 1/2 x 7 Rad. to Pump. |
| Mitchell—All | 1/4 & 3/8 | 1/4 & 3/8 | 1 3/4 x 9 1/2 | 1 1/2 x 4 1/2 Pump to Cyl. |
| Moline—M40 | 5/16 | 3/16 | 2 5/8 x 10 | 2 1/4 x 13 1/2 |
| Moline—MK50 | 3/8 | 5/16 | 2 3/4 x 5 3/4 | 2 3/4 x 7 1/4 |
| National | .. | .. | ..... | ..... |
| Oakland—36 | 5/16 | 1/4 | 1 1/4 x 14 | 1 1/4 x 9 1/2 |
| Overland—79 | 1/4 | 1/4 & 3/8 | 2 1/4 x 3 3/4 | 2 1/4 x 6 1/2 |
| Packard—1-38 | 3/8 | 1/4 | 1 11/16 | 1 3/4 |
| Packard—3-48 | 3/8 | 1/4 | 1 3/4 | 1 27/32 |
| Packard—2-38 | 3/8 | 1/4 | 1 7/8 | 1 7/8 |
| Packard—4-48 | 3/8 | 1/4 | 1 7/8 | 1 7/8 |
| Paige—F-2 | 5/16 | 3/8 | 1 1/2 | 1 1/4 |
| Pierce-Arrow—C-2 | 1/2 | 3/8 & 5/32 | 1 1/2 | 1 1/4 |
| Pierce-Arrow—B-2 | 1/2 | 3/8 & 5/32 | 1 7/8 | 1 1/4 |
| Pierce-Arrow—A-2 | 1/2 | 3/8 & 5/32 | 2 1/8 | 1 5/8 |
| Premier—A | 3/8 | 3/8 | None | None |
| Reo—R & S | 1/4 | 1/4 | 1 | 1 |
| Stearns—All | 5/16 | 1/4 & 5/16 | 1 1/2 x 4 | 1 1/2 x 6 |
| Studebaker—SC | 1/4 | 3/8 | 1 5/8 x 9 | 1 7/8 x 5 |
| Studebaker—EB | 1/4 | 3/8 | 1 7/8 x 8 3/4 | 1 7/16 x 2 1/2 |
| Studebaker—3 | 1/4 | 3/8 | 1 5/8 x 9 | 1 7/16 x 2 1/2 |
| Stutz—E | 3/8 | 5/16 & 3/8 | 1 1/2 | 1 1/2 |
| Westcott—O-30 | 5/16 | 5/16 | 1 1/2 x 18 | {1 1/4 x 4 / 1 1/2 x 10} |
| Winton—20 | 1/4 | 1/8 & 1/4 | 1 1/8 x 5 1/2 | 1 1/4 x 15 |

## 1915 Models

| Car and Model— | Gasoline Tubing Diam. | Oil Tube Diam. | HOSE Diameter and Length (Upper) | HOSE Diameter and Length (Lower) |
|---|---|---|---|---|
| Allen—All | 3/8 | 5/16 | 2 x 6 | 1 1/2 x 6 1/2 |
| Apperson—All | 5/16 | .. | 1 1/4 | 1 1/4 |
| Biddle—C | 5/16 | .. | 2 x 7 1/2 | 1 1/2 x 7 1/2 |
| Briscoe—B-15 | 5/16 | 5/16 | 1 1/2 x 5 | 1 1/2 x 8 |
| Cadillac—51 | .189 Ins. | .243 | 1 1/4 | 1 1/4 x 5 1/2 |
| Case—R-15 | 5/16 | 3/8 | 1 3/16 x 6 1/2 | 1 5/16 x 13 |
| Chalmers—26-B | 3/8 | 3/8 | 2 1/2 x 3 | 2 1/4 x 3 1/2 |
| Chalmers—29 | 3/8 | 3/8 | 1 3/4 x 6 1/4 | 1 1/2 x 14 |
| Chalmers—32-A | 3/8 | 5/16 | 2 3/8 x 3 | 2 1/4 x 3 1/2 |
| Chandler—16B | 5/16 | 1/2 & 1/4 | 1 3/8 x 8 1/2 | 1 3/8 x 9 7/8 |
| Chevrolet—490 | 5/16 | 3/8 | 1 3/4 x 3 3/4 | 1 3/4 x 3 3/4 |
| Cole—850 | 5/16 | 5/16 | 1 1/2 x 18 | 1 1/4 x 3 3/4 |
| Crow-Elkhart—25 | 1/4 | 3/8 | 1 1/4 x 6 | 1 1/4 x 14 |
| Cunningham | 5/16 | 1/4 | 1 1/4 x 5 1/2 | 1 1/4 x 3 3/8 |
| Davis—38 | 5/16 | .. | 2 x10 | 2 x12 |
| Davis—6-50 | 5/16 | .. | 1 1/2 x 10 | 1 1/2 x 12 |
| Dodge—All | 5/16 | 3/8 | 1 3/4 x 6 1/2 | 6 7/8 x 1 7/16 |
| Dorris—All | 5/16 | 3/8-5/16-1/4 | 1 1/2 x 4 1/4 | 1 1/4 x 6 1/4 |
| Dort—4 | 1/4 | 5/16 | 2 1/4 x 6 1/2 | 2 1/4 x 11 1/4 |
| Dort—All | 1/4 | 5/16 | 2 1/4 x 7 3/4 | {2 1/4 x 11 1/4 / 2 1/4 x 15 1/8} |
| Ford | 1/4 | 3/8 | 2 x 3 1/2 | 1 3/4 x 2 3/4 |
| Franklin—Ser. 7M | 3/8 | 1/4 | None | None |
| Grant—T | 3/8 | 5/16 | 2 1/8 x 7 3/4 | 2 1/8 x 3 1/2 |
| Haynes—31 & 32. | .. | .. | 1 1/4 x 1 3/4 | to Pump. |
| Haynes—31 & 32. | .. | .. | 1 1/2 x 4 1/2 | to Radiator. |
| Haynes—30 & 33. | .. | .. | 1 1/4 x 2 3/4 | to Pump. |
| Haynes—30 & 33. | .. | .. | 1 1/2 x 8 1/4 | to Radiator. |
| Hudson—40 | 3/8 | 1/4 | 1 1/2 x 6 3/4 | 1 1/4 x 6 3/4 |
| Hudson—54 | 3/8 | 5/16 | 1 1/2 x 3 1/4 | 1 1/2 x 11 1/4 |
| Hupmobile—K | 1/4 | 5/8 | 2 1/2 x 11 1/2 | 1 7/16 x {16-R / 12-L} |
| Inter-State—T | 5/16 | 3/8 | 2 1/4 x 3 11/16 | 2 x 5 1/2- |
| Jackson—All | 1/4 | 3/8 | 1 1/2 x 12 | 1 1/2 x 12 |
| Jeffery—104 | 5/16 | 5/16 | 1 1/2 x 12 1/2 | 1 1/4 x 18 1/2 |
| Jeffery—106 | 5/16 | 5/16 | 1 1/4 x 6 1/4 | 1 1/4 x 6 1/4 |
| KisselKar—4-36 | 5/16 | 1/4 | 1 1/2 x 8 1/2 | 1 1/2 x 11 1/4 |
| KisselKar—6-42 | 5/16 | 1/4 | 1 1/2 x 6 3/4 | 1 1/2 x 8 3/4 |
| Lexington—4-K | 5/16 | .. | 1 3/4 x 15 1/4 | 1 x11 1/2 |
| Lexington—6-L | 5/16 | .. | 1 3/4 x 10 1/2 | 1 1/4 x 11 1/2 |
| Locomobile—All | 3/8 | 1/2 | 1 25/32 x 8 | 1 25/32 x 8 |
| McFarlan—All | 5/16 | 5/16 | 1 7/8 x 8 | 1 1/4 x 6 |
| Mercer—All | 5/16 | 5/16 | 1 1/4 x 9 | 1 1/4 x 4 3/4 |
| Metz | .. | .. | ..... | ..... |
| Mitchell—All | 1/4 | 3/8 | 1 1/2 x 11 | 1 1/8 x 12 1/2 Rad. to Pump. |
| Mitchell—All | 1/4 | 3/8 | 1 1/2 x 11 | 1 1/8 x 5 Pump to Cyl. |
| Moline-Knight—50 | 3/8 | 5/16 | 2 3/4 x 5 3/4 | 2 3/4 x 7 1/4 |
| Moline-Knight—40 | 5/16 | 5/16 | 2 1/4 x 5 1/2 | 2 3/4 x 7 1/4 |
| National | .. | .. | ..... | ..... |
| Oakland—37 | 5/16 | 1/4 | 1 1/2 x 13 | 1 1/4 x 4 5/8 |
| Overland—80 | 1/4 | 1/4 & 3/8 | 2 1/4 x 4 1/2 | 2 1/4 x 6 1/2 |
| Overland—81 | 1/4 | 1/4 & 3/8 | 1 3/4 x 4 3/4 | 1 3/4 x 8 |
| Overland—82 | 1/4 | 1/4 | 1 3/4 x 6 1/4 | 1 1/4 x 7 |
| Owen Mag.—O-36. | 5/16 | 5/16 | 1 9/16 x 10 1/2 | 1 9/16 x 8 |
| Packard—All | 3/8 | 1/4 | 1 7/8 | 1 7/8 |
| Paige—H-1 | 5/16 | 5/16 | 1 13/16 out. | 1 5/16 out. |
| Paige—G-1 | 5/16 | 5/16 | 2 1/16 out. | 1 9/16 out. |
| Peerless—48-6 | 7/16 | 7/16—1/4 | 1 9/16 x 4 1/2 | 1 13/16 x 10 1/4 |
| Peerless—54 | 7/16 | 7/16—1/4 | 1 13/16 x 12 | 1 13/16 x 8 |
| Peerless—55 | 7/16 | 7/16—1/4 | 1 1/2 x 13 1/2 | 1 1/4 x 15 5/8 |
| Pierce-Arrow—C-3 | 1/2 | 1/4 & 13/32 | 1 1/2 | 1 1/4 |
| Pierce-Arrow—B-3 | 1/2 | 1/4 & 13/32 | 1 7/8 | 1 1/4 |
| Pierce-Arrow—A-3 | 1/2 | 1/4 & 13/32 | 2 5/8 | 1 5/8 |
| Pilot—6-55 | 5/16 | 5/16 | 1 3/4 x 16 | 1 x 8 |
| Premier—6-50 | 3/8 | 1/4 | 1 1/2 x 6 | 1 5/16 x 3 1/2 |
| Reo—R & S | 1/4 | 1/4 | 1 | 1 |
| Reo—M | 1/4 | 1/4 | 1 1/2 | 1 1/4 |
| Stearns—SKL-4 | 5/16 | 1/4-5/16-1/2 | 1 3/8 x 6 | 1 3/8 x 9 |
| Studebaker—SD | 1/4 | 3/8 | 1 5/8 x 9 | 1 7/8 x 5 |
| Studebaker—EC | 1/4 | 3/8 | 1 7/8 x 8 3/4 | 1 7/8 x 5 |
| Studebaker—5 | 1/4 | 3/8 | 1 5/8 x 9 | 1 7/16 x 2 1/2 |
| Stutz—F | 3/8 | 5/16 & 3/8 | 1 1/2 | 1 1/2 |
| Westcott—O-35 | 5/16 | 5/16 | 1 1/2 x 18 | {1 1/4 x 4 / 1 1/2 x 10} |
| Westcott—U-50 | 5/16 | 5/16 | 1 1/2 x 12 | {1 1/4 x 5 / 1 1/2 x 10} |
| Winton—21 | 1/4 | 1/8 & 1/4 | 1 1/8 x 5 1/2 | 1 1/4 x 15 |
| Winton—21A | 1/4 | .. | 1 1/2 x 6 | 1 1/4 x 24 |

# The Motor Car Repair Shop

## Practical Maintenance Hints




## Portable Crane Horse

MOST shops find a large crane horse mounted on casters useful in holding up the front or rear of a car or truck while work is being done on the wheels or axles. Here is a typical design. It is made of yellow pine and is capable of holding up quite a large truck. A differential chain hoist should be hung from the center of the cross member to do the lifting. Such a crane also may be used for lifting out an engine.

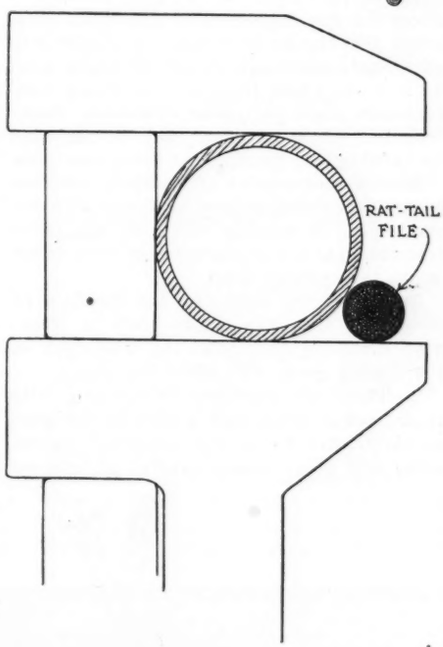
## For Sticking Gasket

To prevent a cylinder head gasket from sticking to the cylinder or the cylinder head, smear it on both sides with grease or 600-W. With this precaution the head may be removed several times without replacing the gasket.

## Hardening Lathe Tools

To obtain the best results with lathe tools and other cutting tools employed on machine tools, they must not only be sharp but also properly hardened and tempered.

First the tool should be heated to a cherry red for about 3 in. back of the point, and then the point should be plunged into cold water until it is cool. At this moment there is perhaps an inch of the end of the tool which is cold, the next inch or two is red but cooled off from the original cherry, and the remainder of the tool is black. One side of the tool is polished quickly with a stick covered with a strip of coarse emery paper. When the tip of the tool shows a pale yellow it should be plunged into water until cool. If it is found that the tool is too soft for the purpose, the process should be repeated but the tool plunged into the water when the tip is a paler yellow, and if too hard, the process should be repeated and the tool thrust into the water when the tip is a deeper yellow.




## Wrench for Pipes

A Stillson wrench is not needed very much around the garage, consequently, when its use is desired for the tightening of a pipe on the air pump line or some other place where a pipe is used, none is available. The ordinary monkey wrench will serve if used as follows: Place the wrench around the pipe and insert between the jaws a rat-tail file, as shown in the illustration.

## Overheating Trouble

When an engine overheats it is not hard to determine whether the difficulty lies in the cooling system or not. Nevertheless a recent trying experience an owner had in one of the best service stations in the country shows that not every mechanic knows how to look for overheating trouble.

The car boiled readily after it was driven 2 miles and continued to boil. Snap judgment decreed the carbon should be burned out. But when this was done no improvement was noted. The fan belt was tightened, the carbureter and spark setting were inspected, the radiator was flushed and still there was no clue. At this point the owner became disgusted and took the car to another shop.

There, a seasoned mechanic felt the radiator top and bottom and stated that there was something wrong with the circulation. Just that simple act and he eliminated carbureter, spark and carbon troubles. The top of the radiator was hot and the bottom was cold, relatively. With the engine still running, he looked in through the filler spout and confirmed his suspicions—there was just a trickle of water flowing into the radiator from the engine.

He questioned the owner, who insisted the radiator had been flushed. From the rate water ran through it there was no question but that the obstruction to flow was not caused by sediment. The presence of new hose connections made it extremely unlikely they were causing the stoppage. So by elimination he proved to himself the trouble was in the pump. Forthwith he removed it and found that the pin holding the impeller on the shaft had dropped out.

Simple, wasn't it? Yet the first service station could make nothing but mystery out of it.

In conclusion it should be explained that if the radiator is very hot at the top and rather cold elsewhere it shows stoppage of circulation. On the other hand if the radiator is boiling hot at the top and warmer than usual at the bottom it shows that the circulation is O. K. and that the trouble is elsewhere.

## Greasing Universals

A dry universal wears rapidly and frequently seizes and breaks if it lacks grease. Do not neglect, therefore, the lubrication of your universal joints. True, it is usually a lot of trouble to grease them. They are under the car and just when you feel like doing the job no grease gun is handy. However, to neglect them is to court disaster. They should be lubricated about once a month.

## Pressure for Testing

Only a small pressure is required for testing a radiator or a tank—just enough to blow away any dirt that happens to lodge in the leaky place. Half a pound pressure is usually sufficient and will yield a copious supply of bubbles when the radiator or tank is placed in water. When compressed air is lacking, whatever pressure can be applied by the lungs will be found sufficient in most cases.

# The Readers' Clearing House

## Questions and Answers

Conducted by B. M. Ikert

### Wants Steam Cyclecar

Q—GIVE instructions to make a steam engine large enough to run a two-passenger cyclecar. I would like to have the engine on the rear axle. What size boiler will the engine need? Where can it be obtained? How can it be heated in the shortest time possible? Should an injecter or a steam pump be used to put water in the boiler?—John Byrne, Miranda, S. D.

We have not on hand any material along this line, but perhaps some of our readers have constructed such an engine and care to impart this information.

### Changing Gear Ratio on Reo

Q—How would the gear of a 1916 Reo touring car be changed to produce more speed?

2—Publish the name of the company that makes the Lukenheimer primer for motor cars. —Robert Kellams, Rockport, Ind.

1—Changing the gear ratio is seldom advised. The engine is designed to deliver and perform at its maximum at the ratio of 4 to 1. If this ratio is reduced to, say 3.5 to 1, it probably will work satisfactorily but the engine will do more work than it was designed to do.

2—The Lunkenheimer Co., Cincinnati, Ohio.

### Remedy for Shaft Play

Q—Publish sketch of transmission and clutch for 1917 Chandler.

2—Give instructions for removing same from car.

3—How can I remedy end play in crankshaft which causes a very decided knock when engine is running at almost any speed?—William Mackham, Syracuse, N. Y.

1—See Fig. 1.

2—Take out toe and floor boards. Disconnect both brake rods by pulling out clevis pins at front end. Then unfasten battery ground wire on transmission and disconnect speedometer cable at lower end. Part universal joint by removing cap screws on flange at rear of transmission and slide joint back. Remove cap screws that hold transmission to crankcase. The transmission then can be removed by pulling it back about 5 in.

3—End play in the crankshaft is taken on the center crankshaft bearing, and the only way to stop play is to spread the bearing collar with a dull chisel all the way around on both sides after dropping oil pan and removing oil in case. This method is satisfactory unless play is very bad, in which case a new bearing should be installed.

### General Elgin Questions

Q—Give instructions to make adjustments on pushrod to valves on Elgin six.

2—How may the clicking noise in these valves be overcome?

3—Which engine will develop the most power, a 3⅛ by 4¼ or a 2⅞ by 4¾?

4—What is the address of maker of Elgin engine?

5—What is the high gear ratio on the 1919 Elgin six?—John Fahrenbruck, Berthoud, Col.

1—To adjust the pushrod to the valves on an Elgin six first remove the timing inspection plate on the top of the flywheel housing, then turn the engine by hand in clockwise direction until D, C, 1, 6 appear on the rim of the flywheel. These should appear right in the center of the opening. With the flywheel in this position for cylinders 1 and 6, numbering from the radiator back, one or the other of these cylinders will be found to have both valves closed, so that both rocker arms on one of the cylinders will have a slight amount of play. The pushrods for these rocker arms should then be adjusted so as to have 0.005 to 0.007 in. clearance between the end of the valve stem and the rocker arm. This is approximately the thickness of a sheet of heavy paper or very light card and is sufficient to allow for the expansion of the valve stem when the engine is warm. You also will note other markings on the flywheel, such as D, C, 3, 4 and D, C, 2, 5, meaning dead center on these particular cylinders. Pushrods for these cylinders may be adjusted by turning the flywheel to these positions.

Half a teaspoonful of kerosene inserted on the valve stem at least once a week while the engine is running will keep the valve free from carbon and prevent it from sticking in the cylinder head.

In setting the marks on the flywheel be careful to turn the engine only in clockwise direction otherwise the blacklash in the timing gears will affect the result.

2—These are overhead valves and, with their rocker arms and pushrods designed as they have to be for overhead valves, noise will occur unless careful adjustment is made. If the tapping occurs after adjusting all the rods to 0.005 in., then reduce the clearance by another thousandth. This should be done only in extreme cases, as loss of power is liable to result if the engine becomes too warm. Expansion of the pushrods will cause the valves to remain open slightly after the lobe of the cam releases the tappet.

3—Gas engine power is dependent upon the speed of the engine almost directly, until the upper part of the peak of the curve is reached. The horsepower would be greater on the engine having the largest bore if the speeds remained the same, but if the smaller engine is speeded up so its power is the same as the large engine the small engine would show the most fuel economy. This is true speaking generally of gas engines.

4—Elgin Motor Car Corp.

5—Five to 1.

### Prest-O-Lite Gas for Starter

Ottawa, Ill., Editor MOTOR AGE—I recently installed a firing device on my car that will start the engine if it can be turned over. I drilled and tapped a hole in the intake manifold and fitted a priming plug. This part is essential as it has very small holes and without this there would be too much waste. From this plug I ran a brass tube to a Prest-O-Lite tank, connected to the plug and tank with the expansion connection. When the gas is turned on the small holes in the firing plug let in the right amount of gas, and it will start no matter how cold. In my case it was all made from old stuff I had. The tank was partly

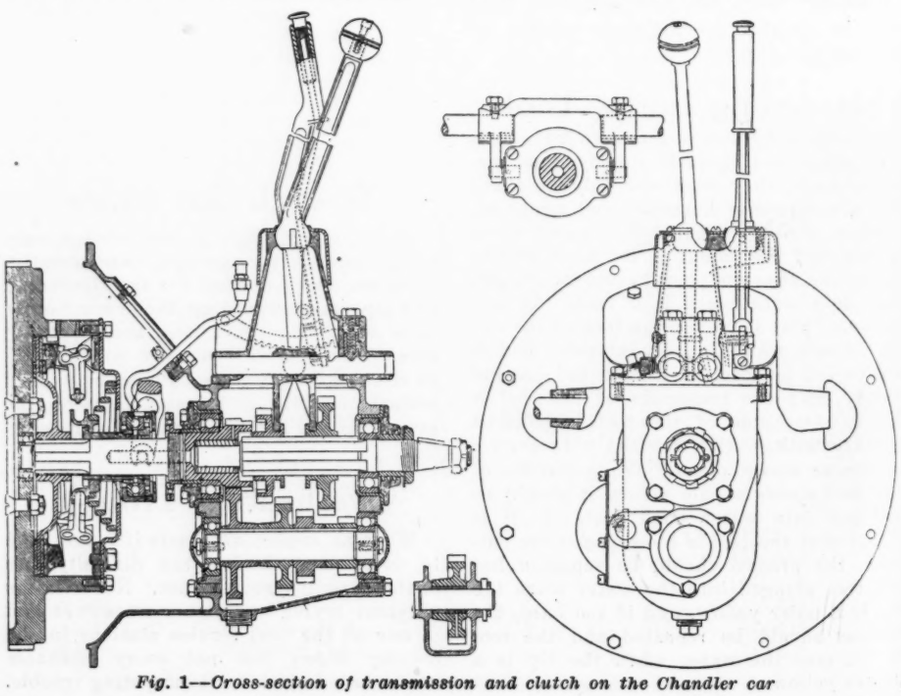


*Fig. 1—Cross-section of transmission and clutch on the Chandler car*

full, and I had been unable to sell it. These tanks can be bought very cheaply from the junk men, empty, and then exchanged for full ones. I have tried ether with a primer, but this beats it as the gas will fire from the smallest spark no matter how cold.—W. B. Ellworth.

### Picture of Fiat Engine

Q—Publish illustration of both intake and exhaust side of the Fiat engine.—R. F. McCain, Lincoln, Neb.

This is not available.

### Wilcox's Stutz of 1915

Q—Publish a picture of Howdy Wilcox's Stutz of 1915 or tell me where I can get a good side view picture of it?—E. Ronsaville, Kensington, Md.

Howdy Wilcox's Stutz is shown in Fig. 2.

### Soldering Acids

Q—What kinds of acids are used to clean different metals so they may be soldered?

2—What cars are being equipped with Liberty engines?—W. C. Parish, Southwest City, Mo.

1—Muriatic or sal-ammoniac, resin, any of these can be used with success. On galvanized iron use raw muriatic acid, but otherwise cut it with zinc.

2—None.

### Brass in Babbitt

Q—Would it be well to put a lot of brass in the babbitt when babbitting the crankshaft and connecting rods on a 30-60 R. & P. gasoline tractor?

2—Is the babbitt metal of the old borings as good as new babbitt?—Hans Lien, Brockton, Mont.

1—There would be nothing to gain by this, and inasmuch as the brass would be softer it would be detrimental. Besides, brass would not mix well with the babbitt.

2—Yes.

### Asks Opinion on Steam Car

Q—What is your opinion of the steam car? Will these cars be as popular in the future as the gas car? What has been the trouble with the steam cars in the past?—W. H. Shedd, Pittsfield, Mass.

The steam car offers great possibilities. It can burn kerosene or even the lower-grade distillates. Its mileage is equal to or better than that of the gasoline car, considering size, weight and actual fuel cost. Its power is only limited by the size of the boiler, and if a large water space is present in the boiler, a demand for steam momentarily can be met that is 300 or 400 per cent in excess of the ordinary supply. The torque of the steam car is powerful and is present even when the engine is standing still, which is a feature the gas engine does not possess.

The early types of steam cars used a flash boiler, which was the one thing that made the public lose its faith in the steam car. A flash boiler has no business in a place where the demand for steam is as varied as it is in the steam car. The flash boiler was the reason for many steam cars that blew up. But now that this method of steam generation is not used this objection has been overcome. The old dread of the steam car still remains with the public, and this has been the chief drawback that it has had to contend with. Large sums of money would have to be spent in educating the public to the value of the steam car before it could be produced with as much commercial success as several prominent gas cars.

**TO assist readers in obtaining as a unit all information contained in this department on a certain subject MOTOR AGE segregates inquiries into divisions of allied nature. Questions pertaining to engines are answered under that head, and so on.**

**MISCELLANEOUS**

John Byrne.....Miranda, S. D.
Robert Kellams.....Rockport, Ind.
William Mackham.....Syracuse, N. Y.
John Fahrenbruck.....Berthoud, Col.
W. B. Ellsworth.....Ottawa, Ill.
R. F. McCain.....Lincoln, Neb.
E. Ronsaville.....Kensington, Md.
W. C. Parrish.....Southwest City, Mo.
Hans Lien.....Brockton, Mont.
E. S. Phillips.....Spokane, Wash.
W. H. Shedd.....Pittsfield, Mass.
W. E. Swanson.....Mount Jewett, Pa.
G. A. Fox.....Carbon, Iowa
J. G. Watt.....Wanatah, Ind.
P. F. Gilman.....Philadelphia, Pa.
Subscriber.....Highview, Sask.

**THE ELECTRIC SYSTEM**

M. H. Lyons.....Kansas City, Mo.
A. Zelm.....Chicago
Jack Beard.....Detroit
J. E. Caines.....Ashland, Ky.
William Van Oosting.....Litchville, N. D.
F. O. Crosby.....Toledo, Ohio
William Olson.....Fonda, Iowa
J. D. Mitchell.....Centerton, Ark.
Harry Duncan.....Fresno, Cal.
George E. Oddy.....Wichita, Kan.
C. C. Frybarger.....Crawford, Neb.

**ENGINES**

E. H. Jacobson.....Canton, Minn.
Charles W. Weager.....Rockford, Ill.

**REBUILDING**

W. F. Walker.....Oxnard, Cal.
H. T. Ballah.....Clinchburg, Va.
R. D. Mowry.....Manhattan, Kan.
C. H. Rice.....Tuscaloosa, Ala.
Robert Kellams.....Rockport, Ind.
J. Minor Ewing.....Minneapolis, Minn.

**LUBRICATION**

H. M. Cole.....Fillmore, Ill.
F. L. Baird.....Chapman, Neb.

**CARBURETION**

W. J. Rapp.....San Jose, Ill.

**No communication without the writer's name and address will be answered in these columns.**

### Steering Spindle on Chevrolet

Q—Publish instructions for removing the steering spindles on a 1917 Chevrolet 490. These have never been off since the car was new, and I would like to remove them to replace new bushings.—W. E. Swanson, Mount Jewett, Pa.

The car first must be jacked up. Then the cotter pin in the nut at the lower end of the steering spindle bolt is removed and the nut unscrewed. In pulling this nut out from the top, great care should be exercised or the bolt will be ruined. The wheel must be held up and the bolt relieved of the weight of the wheel. Then pull out the bolt, taking care to see that the threads on the bolt are not burred in any way. If the bushing sticks and will not pull out with ordinary means, a washer slightly smaller than the diameter of the hole in the spindle but larger than the diameter of the bushing can be placed at the bottom of the spindle with a bolt through it, and a nut at the top with a yoke to fit over the bushing will pull out the bushing.

### Repainting a Car

Q—What is the best way to remove paint from a large six-cylinder car to repaint?

2—What amount of paint is required?

3—Name some good paints.

4—Should a car be varnished after it has been painted?—G. A. Fox, Carbon, Iowa.

1—Any good varnish or paint remover, sold in the hardware or paint stores.

2—Two or three coats of flat colors for dark colors and three or four for lighter jobs. Rub down between coats.

3—Any of the old established paint concerns make a product that gives good service.

4—Coach paint requires varnishing to finish the job.

### Ford Clutch Slips

Q—My 1917 Ford has been run one year and three months and when I want to open it up it seems as though the clutch is slipping. The engine seems to be running very fast, but the car does not move any faster. I have had the finger points taken up, but this does not seem to help. The clutch holds all right in low and high and seems to hold in second until I start in second speed. What is the remedy?—J. G. Watt, Wanatah, Ind.

The planetary brake band is worn. The remedy is new lining on the brake.

### Enamel on Cars

Q—The enamel on the fenders and splash pan of my Cadillac was varnished, and after a short time the varnish cracked and became a light color and in some places began to come off and leave a glossy surface like original enamel under

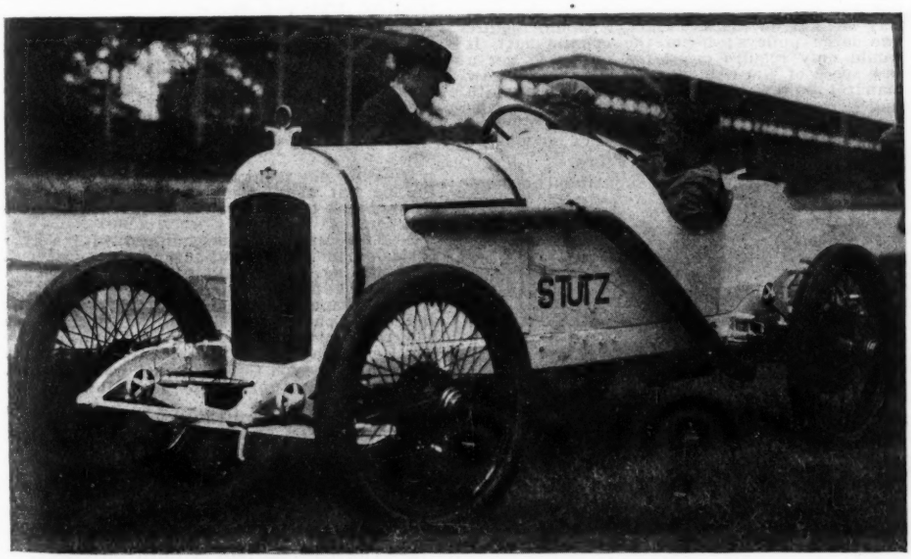



*Fig. 2—This is the Stutz driven by Howdy Wilcox*

the cracked varnish. Is there any way to remove the varnish from the enamel on these parts without spoiling the enamel?

2—Is enamel baked on the fenders or put on with a brush?

3—Can most painters enamel fenders?

4—How often should the spring bolts and bushings on a Cadillac 57 be renewed and which ones have the most wear?

5—What make piston rings should be used on a Cadillac 57?

6—What speed is a standard four-passenger 57 Cadillac eight capable of doing under favorable conditions?

7—Is there a place in Chicago where repairs for a Boyce Moto-Meter may be procured?—Robert Banta, Ridgefarm, Ill.

1—Anything that will attack varnish also will have a tendency to destroy enamel, although not so rapidly. Any paint store can furnish a varnish remover, and it might be well to try a spot to see what results will be attained. Again the varnish can be sanded down so that practically all is removed—at least all that is loose or chipped will be. Then the fender should be given a coat of flat black, rubbed down a little, given a coat of color, black, varnish, rubbed, a coat of rubbing varnish and rubbed and finally a coat of finishing varnish. This ought to make a fairly good job.

2—Enamel is flowed on with a brush and then baked in an oven, although an air-drying enamel can be used. But this is not apt to give entire satisfaction, for it may chip off if stiff enough to dry thoroughly.

3—Few painters are equipped to do enameling, for this requires an oven—with the exception as noted. It would be better to ship your fenders to Chicago and have them enameled and baked.

4—The bushings ought to show the major portion of the wear, but, of course, the bolts will have some. The bolts being hardened and the bushings reasonably soft the latter alone should be replaced. These will come of such size that they can be reamed out to fit the bolts. Naturally the bolts will show a little wear on one side, but it will not be material if fitted fairly tight in the bushings.

5—The Cadillac uses an ordinary split ring, but other forms may be used. MOTOR AGE cannot make recommendations as to which should be used.

6—On a perfect road, with no wind, top down, car adjusted and engine tuned to do what it should do in the way of performance, a Cadillac of this model ought to be able to travel upward of 75 m.p.h.

7—It will be a better plan to send it to the maker.

### Adjusting Dodge Car

Q—Publish a sketch of rear axle on Dodge Brothers 1915 car.

2—Also suggest how to adjust so as to make less noise.—R. F. Gilman, Philadelphia, Pa.

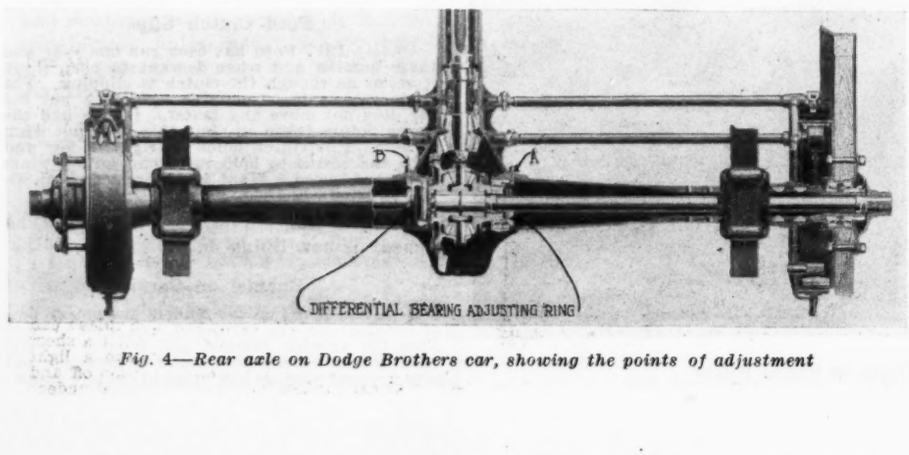



*Fig. 4—Rear axle on Dodge Brothers car, showing the points of adjustment*

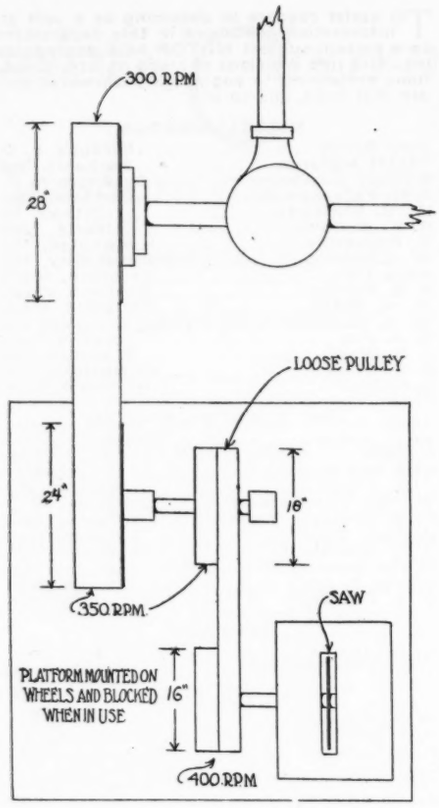



*Fig. 3—Layout and dimensions whereby reader can run small portable sawmill*

1—The Dodge rear axle is shown in Fig. 4.

2—The adjustment is made by loosening the set screws A and B, then screwing up on the differential bearing adjusting ring on the left side after first loosening the corresponding ring on the right side. Screw this adjustment up until it is slightly tight and then back it off just enough to ease the gears. The adjustment should be tested by hand before the power of the engine is applied through the gears.

### Reader Wants Sawmill

Q—I want to run a small portable sawmill with a model 38 Overland. What engine speed would get the most horsepower? With an engine speed of 1200 r. p. m. it would give me an axleshaft speed of 300 r. p. m. Where shall I put the large pulleys or pulley, as the case may be? If on the axleshaft, it would require two large pulleys; if on the countershaft, it would only require one large pulley to get a saw speed of 400 r. p. m. The size of the saw mandrel pulley is 18 by 8 in. What width pulley would you advise putting on the axleshaft? If you advise putting a large pulley on the countershaft, what size pulley should be used?—Subscriber, Highview, Sask.

It is not a question of securing the maximum horsepower and then running at that speed, because if you do, an overload will kill the engine. So it is better to run at about 1200 r. p. m., which you suggest. Since the pulley on the mandrel shaft is 8 in. wide, it is built to take a 4-in. belt from two 4-in. pulleys on the countershaft, one of these being a loose pulley and the other a fast pulley. We suggest a construction as shown in Fig. 3. It will be necessary to lock the differential in the rear axle of the car. It is possible for you to secure a pulley that will take the place of the tire on the car wheel. This pulley can be locked on the wheel with the bolt studs that hold the tire. Its diameter is shown.

## The Electric System

### Hudson 6-54 Wiring

Q—Publish complete wiring diagram for a 1913 Hudson 6-54.

2—Explain just how the current regulator on this car works?

3—Explain how to regulate the rate of charging?

4—Why do they not equip this car with an ammeter? Insert an ammeter in the circuit if advisable.

5—Does the meter take the place of the ammeter?—M. H. Lyons, Kansas City, Mo.

1—The wiring of the Hudson 6-54 is shown in Fig. 7.

2—This current regulator is a device that controls the voltage in the field circuit of the generator. It is a vibrator that inserts into the field circuit a resistance, when the voltage of the generator is too much, and cuts it out as soon as the generator voltage becomes low.

3—The charging rate can be adjusted by shifting the position of the generator brushes or decreasing the resistance of the unit in series with the field of the generator.

4—This car has a 6-24 volt system, and it is impossible to connect an ammeter into the circuit as it now exists. Some changes in the system would have to be made.

5—No, an ammeter cannot be put in the place of the meter.

### Connections on Crow-Elkhart

Q—Give a wiring diagram of model E-25, Crow-Elkhart car.—A. Zelm, Chicago.

This is shown in Fig. 5.

### Hudson 1914 Wiring

Q—Publish wiring diagram of Hudson 1914 ignition, lights and starter.

2—What weight wire should be used on the starter and generator?—Jack Beard, Detroit.

1—This is shown in Fig. 6.

2—Use wire No. 00, B. & S. wire gage and No. 12 on generator leads.

### One Lamp Only Burns

Q—Only one front light will light at a time. Pulling out the lower button lights the left front, but when the right is on the left goes out.

2—This Maxwell was equipped with a type D dash panel. The cut-out points burnt out, necessitating the installation of a new panel, but the old ammeter was used, being apparently in good shape. The ammeter got a short in it and burnt out the whole new panel. Explain how the short in the ammeter would affect the panel and why the cut-out points should burn out? A new type G dash panel was installed. —Matt L. Donovan, Jr., Bernard, Iowa.

1—Your trouble lies in the switch. In nine out of ten cases the back wiring that closes the circuit will be found loose when this trouble manifests itself; or possibly it is burned out. The simplest and cheapest remedy is to install an entire new switch.

2—The cut-out points burn out because all the current from the generator goes

through all the points. When the engine stops the springs become loosened and the points do not permit demagnetization because the switch panel has been burned out.

### Car Lacks Power

Q—Give wiring diagram of the 1912 Oakland 40. This car will not give the power I think it should. I have been told this model never did develop enough power for hills. Do you know anything about it?—J. E. Caines, Ashland, Ky.

This diagram is shown in Fig. 8. The Oakland 40 gives a calculated horsepower of 27.3 which represents a fairly powerful car. It is probable your valves need grinding and the car needs overhauling. Remember that this is a 1912 car running on 1919 fuel for which it never was designed. It might do well to secure a new manifold and possibly a new carbureter. A good system of fuel heating also will help you out, for this is a problem that it was not necessary to solve in 1912.

### Bulbs Burnt Out

Q—The bulbs on my 1915 Buick have burned out. What can I do for this?—William Van Oosting, Litchville, N. D.

The remedy is, new bulbs, but this will be of no material avail unless the cause of the trouble is located and a remedy is found. After you have put in new bulbs try the lights. If they do not burn trace the wiring from the combination switch to the battery; there may be a loose connection somewhere or a fouled terminal. If all the bulbs burned out simultaneously, it would indicate an excessive current, which in turn points to a defect in the generator output controlling means.

### Cut-out for Generator

Q—Where can I get a cut-out for a generator and storage battery to keep the current from going into the generator?

2—Show drawing of how to install this.—William Olson, Fonda, Iowa.

1—Any of the electrical equipment manufacturers make these cut-outs. The addresses of the manufacturers can be had by referring to the advertising section of MOTOR AGE.

2—The wiring for these cut-outs is slightly different for each different make, but all depend upon the principle of having one connection from the negative wire leading in and one connection from the positive wire leading in and then coming out on a third binding post. The connecting posts are all properly marked so no difficulty will be experienced.

### Generator on Elgin

Q—Can the generator used on the model 6 E17 Elgin six be adjusted so it will produce a weaker or stronger current?

2—How can this be done?

3—Would it be advisable to adjust the generator to produce a stronger current?

4—What effect would this have on the generator?—J. D. Mitchell, Centerton, Ark.

1—Yes this generator can be set to charge at a higher rate.

2—Remove the cover plate on the generator and you will see a third brush. This is the regulating brush. Its position determines the charge rate of the generator. It can be moved by loosening the set screw and sliding the brush one way or the other to secure the proper amperage.

3—If your car is used a great deal on short trips where no considerable speed is obtained it may be advisable to increase the charging rate.

4—No effect. The generator is built to withstand this increased current.

### Timing Hudson 6-40

Q—I had a timing gear put on my Hudson 6-40 model last spring. The engine runs all right but heats, which it did not do before the timing gear was put in. Timing checks up with markings on flywheel. In overhauling the engine would setting it ahead a notch help?

2—Publish timing diagram of Hudson 6-40.—George E. Oddy, Wichita, Kan.

1—Altering the valve timing by setting the camshaft gears later or earlier one or more teeth will have no beneficial effect and may be detrimental. The fact is that this will not materially change the running of the engine, for that is not where your trouble lies. If later or earlier valve opening or closing were desirable the designers would have used it. It will be a good idea to check up again on the valve timing, for it is possible you have made a mistake.

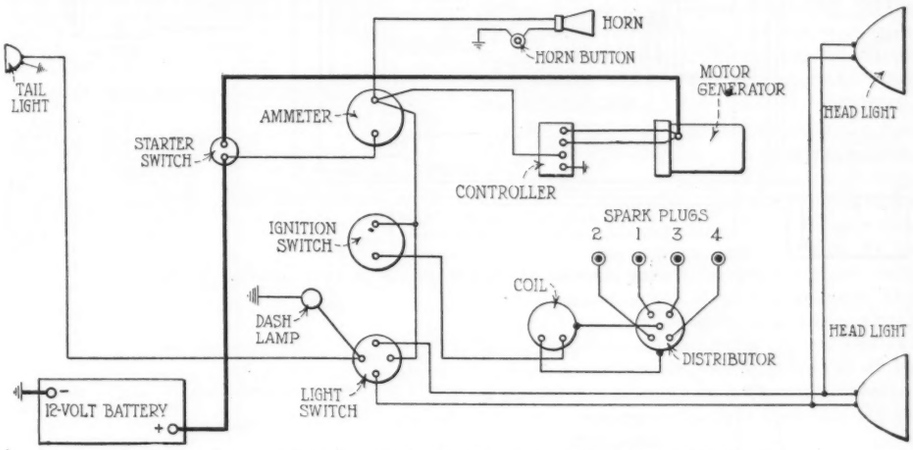



*Fig. 5—Wiring diagram of electric system on E-25 Crow-Elkhart car*

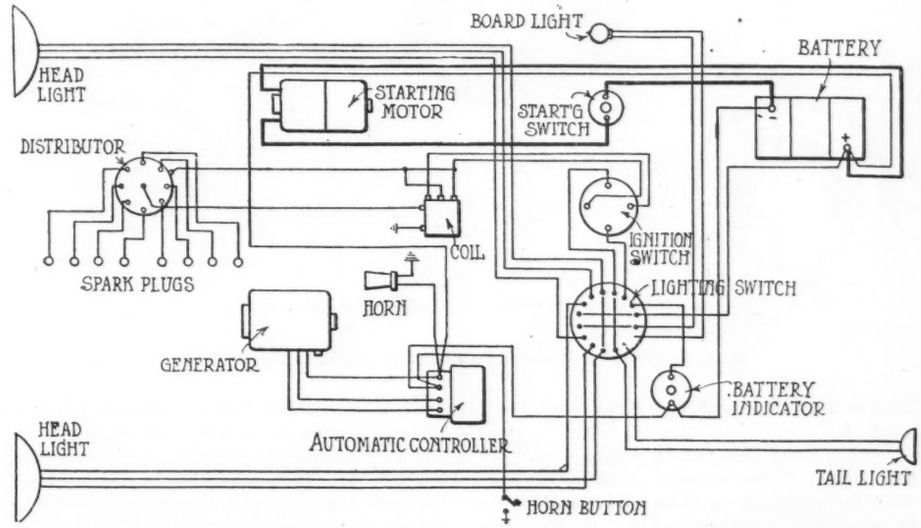



*Fig. 6—Wiring diagram of electric system on the 1914 Hudson car*

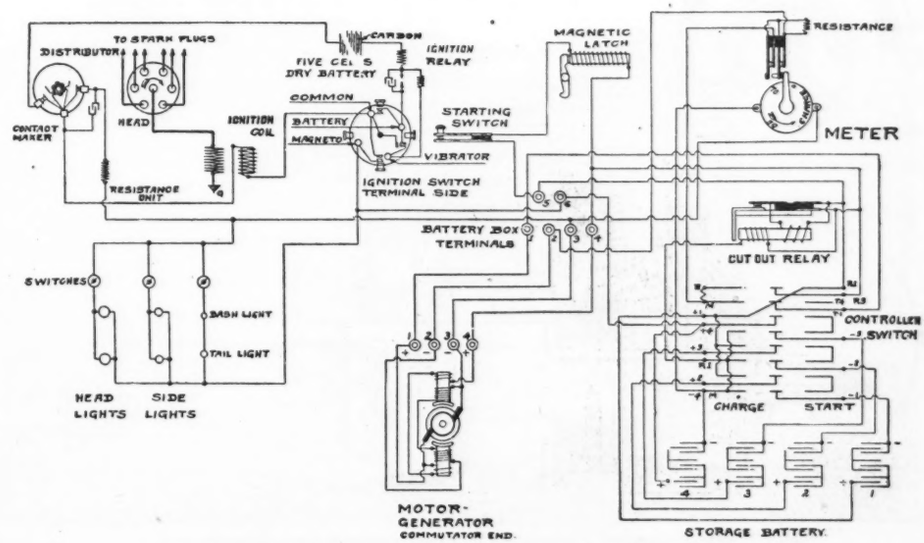



*Fig. 7—Wiring diagram of electric system on the 1913 Hudson car*

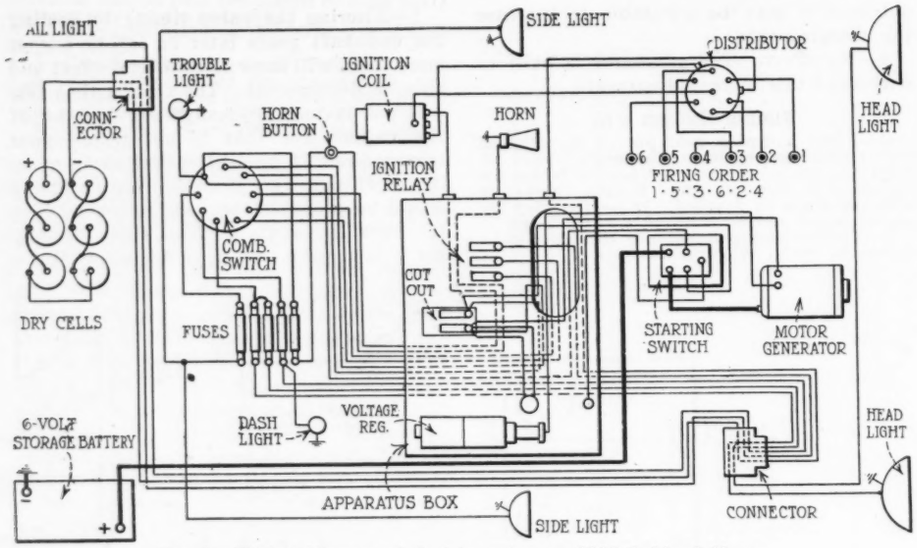



*Fig. 8—Wiring diagram of electric system on 1912 Oakland 40 car*

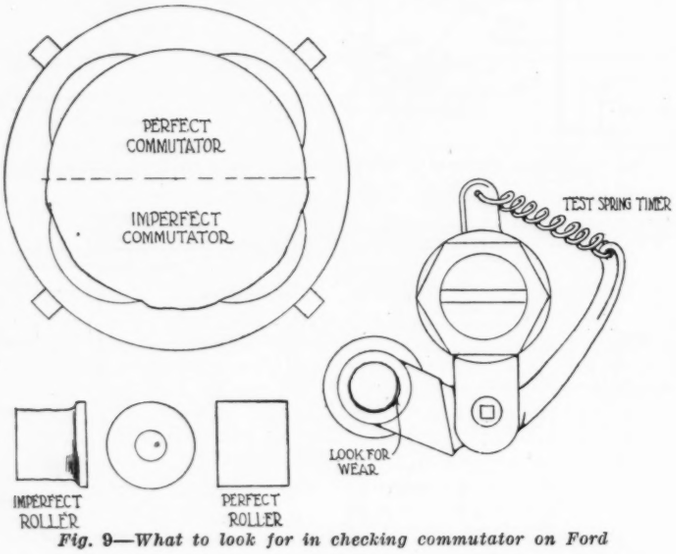



*Fig. 9—What to look for in checking commutator on Ford*

This is a simple matter, for the flywheel is marked.

2—A timing diagram is not necessary in this case. Your trouble is that you are running with late ignition and possibly the radiator has become fouled. Setting the ignition in the Hudson 6-40 is different from that of other cars in that you advance the spark lever so the spark will occur when the letter A on the flywheel is in line with the pointer. It is not unlikely you have set the lever retarded in doing this. If you will follow the valve setting as per marks on the flywheel and also set the spark to occur when the letter A is in line with the pointer you ought to have no further trouble.

There is the possibility that you have used some compound in the radiator as an anti-freezing solution and a stoppage has resulted. It would be well to clean out the radiator with a solution of common washing soda to make sure it is clean. This should be accomplished by making a saturated solution in hot water, putting in about 2 or 3 gal., but being careful that none touches the paint. Leave it in a day or two and drive the car or run the engine now and then. Then drain and rinse out with clear water. It will be well to drain the second time to be sure all the soda has been cleared. At the same time see that the hose connections are good and that the hose is not buckled or crimped so as to prevent free circulation of water.

### Trouble In Switch

Q—I have a model 25 1915 Maxwell, equipped with a Bosch magneto and Simms-Huff starter. I am using a Willard battery. The car and lights work all right, but the starter does not. When the starting pedal is pushed down, a spark occurs at the place the wires connect to the starting pedal, but the starter, horn and ammeter do not budge.—Harry Duncan, Fresno, Cal.

The trouble lies wholly in the switch, and the remedy is in a new one. The old one may be repaired, but installing a new one would be no more expensive.

### Why Breaker Points Burn

Q—What causes the platinum breaker points to burn off excessively on a K.W. magneto as used on a 15-30 hp. Titan tractor?

2—Publish diagram of K.W. showing the course of current in a high-tension magneto.—C. C. Frybarger, Crawford, Neb.

1—This condition existed for some time on account of the poor grade of platinum furnished ignition manufacturers. No new platinum was imported, and the only source of supply was remelted scrap, a very inferior metal but the only thing obtainable. This condition has been eliminated now, and they are getting the same grade of platinum as before the war, and the users can expect reliable service from the material now being used.

2—See Fig. 10, illustrating model H and model T respectively.

## Engines

### Checking Ford Engine

Q—The water in the radiator of my 1918 Ford boils in warm weather when it is run at 25 m. p. h. for about ½ mile. I have scraped

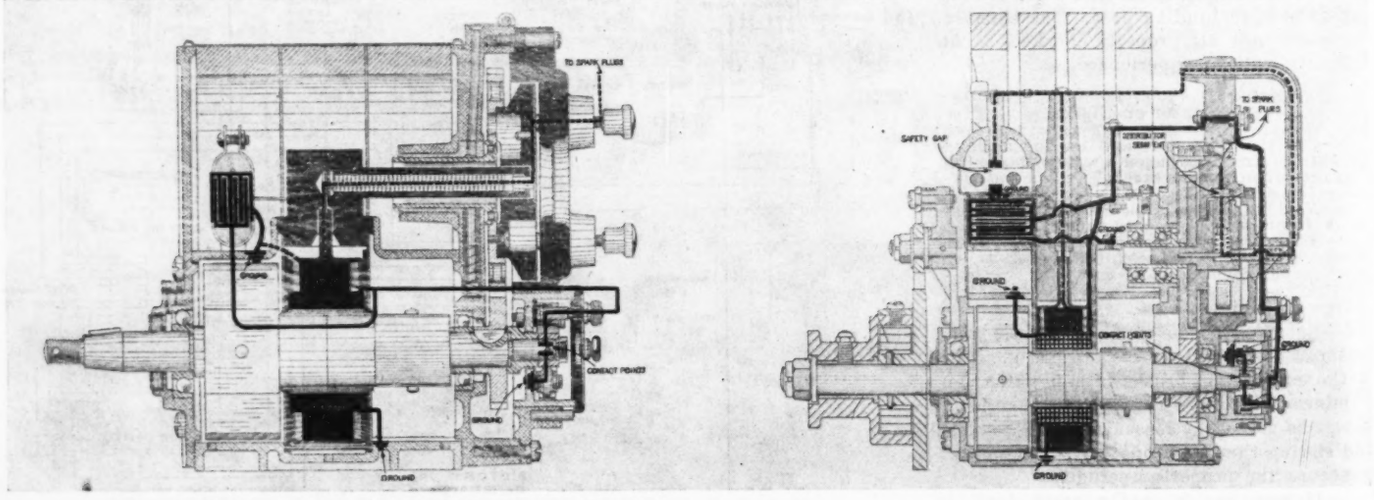



*Fig. 10—Two models of the K. W. magneto, showing the course of the current in each*

out all carbon and reground the valves, but it still boils. The car has run about 2000 miles. The carbureter is set with a thin mixture. Is there anything to improve the circulation? Where can it be obtained?

2—Is the magneto of a Ford strong enough to run both headlights and spotlight?—E. H. Jacobson, Canton, Minn.

It is evident that your engine requires a thorough checking up. Remove the commutator and compare it with the one in Fig. 9, the upper side of which shows a commutator in perfect condition. A commutator worn rough will not permit a permanent contact between the roller and the contact segments at 15 m.p.h. or over. The contact brush or roller will also bear inspection. Test the tension of the little coil spring. It should be strong enough to offer considerable resistance when the roller is pressed inward. Compare the face of the roller with Fig. 9, which shows the principal points of wear. They are sure to cause trouble, shown by a miss in the engine at high speeds, and while it may not be sufficiently imperfect to cause missing it will decrease the efficiency of ignition and cause overheating.

There are reasons for an engine overheating besides that of poor ignition. Check the valve timing. This can be done more easily if the cylinder head is removed, but if one is somewhat experienced it can be accomplished by removing the spark plug of No. 1 cylinder. While cranking the engine insert a finger in the spark plug hole to determine when the piston has reached upper dead center. When upper dead center has been reached, which must be on the exhaust stroke, crank the engine slowly and determine just how far the piston has traveled downward before the intake valve begins to open. If the valves are properly timed the piston will have traveled downward $\frac{1}{16}$ in. when the intake valve begins to lift. Cranking the engine again and coming up on the exhaust stroke the exhaust valve should close on exactly dead center.

It is assumed the valves are in good condition, but it will be well to determine their condition by cranking the engine by hand, noticing the resistance given by each cylinder on the compression strokes. If the resistance is not uniform, it is evident you did not do a perfect job and the operation must be repeated. After having ground the valves special attention must be given to the valve adjustment. There should be a clearance of 0.025 in. between the valve stem and the pushrod. If this clearance is less than that amount, enough material should be filed off the stem to just permit the insertion of a thickness gage which measures the same amount as the clearance required. If a greater clearance than 0.025 in. is found, the stem must be lengthened by drawing out the end of the stem with a light hammer. This operation is for the expert rather than the amateur, but if great care is used it may be accomplished by the owner if he is mechanically inclined.

2—If the Ford magneto is in first class condition it will operate both headlights and spotlight at the same time.

### Better Replace Pins

Q—Publish name and address of manufacturer having material for repairing scored piston pins. The cylinders are in good condition otherwise; therefore I do not want to have same reground.—Charles W. Weager, Rockford, Ill.

Wristpins generally are replaced when worn. It does not pay to patch up one of these pins as the cost is too small.

## Rebuilding

### Redesigning Chalmers

Q—Publish plans for converting a model 17, 1914 Chalmers, roadster into a three-passenger I would like to retain the large gas tank in the rear, lower cowl and instrument board, giving more of a straight-line effect. Expect to cut wheels down to accommodate 33 by 4 tires. I wish to carry one rim and tire on each side well forward on runningboard and also build permanent top.—W. F. Walker, Oxnard, Cal.

This is shown in Fig. 12.

### Hupmobile 32 Into Speedster

Q—Publish suggestion for rebuilding a Hupmobile 32 into a snappy speedster and also design for a top that may be attached quickly in case of a storm. The rear seat has already been removed, and I am figuring on putting in a vacuum system unless you can suggest something more practical.—R. D. Mowry, Manhattan, Kan.

This is shown in Fig. 11. The vacuum system is very practical and besides gets the weight of the fuel down low.

### For Rebuilt Car

Q—Publish name and address of the manufacturer of the Breeze carbureter used on Hupmobile 20 roadster.

2—What would be a good type and make of electric starter for an Abbott seven-passenger car?

3—Would it be practical to equip this car with wire wheels smaller than the original 37 by 4½? My object in this is to save by having smaller tires to buy. I want tires able to carry the car without overloading. The car is cut down and very light in comparison to what it originally was.

4—Would it be cheaper to put a Christensen starter on this car, which has no provision made for a starter?—C. H. Rice, Tuscaloosa, Ala.

1—Breeze Carbureter Co., 250 South street, Newark, N. J.

2—Any of the standard makes that conveniently can be installed. Practically all the makers of starting and lighting outfits have details of all cars and can tell in a moment if their instruments can be fitted to a certain make. You do not state what model you have, and this is necessary.

3—Yes, you can reduce as much as you desire. But you must also remember that it will leave your fenders a good ways from the tires and this will not add to the looks of the car. You can go down to any tire with a 4½-in. section, and probably 34 by 4½-in. would suit. This would leave only 1½ in. more space between fenders and tire, and perhaps if the springs have sagged some this will make up for it. If the car is very much lighter, you might go to 33 by 4 or 34 by 4-in. tires. The 4-in. section tires are somewhat cheaper than the 4½-in.

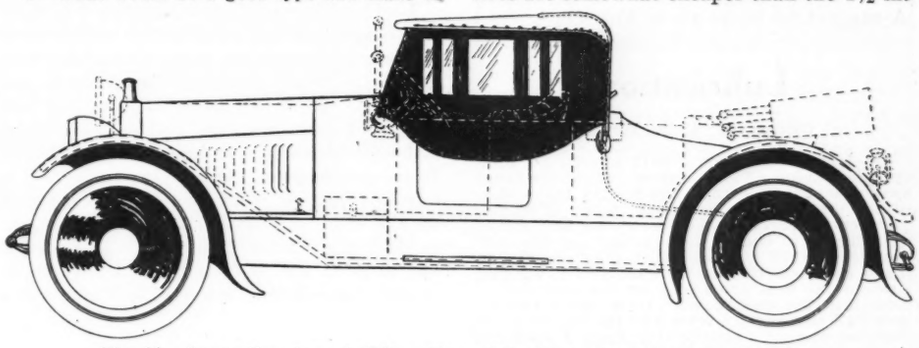


*Fig. 11—Suggestion for rebuilding Hupmobile 32 as speedster with storm top*

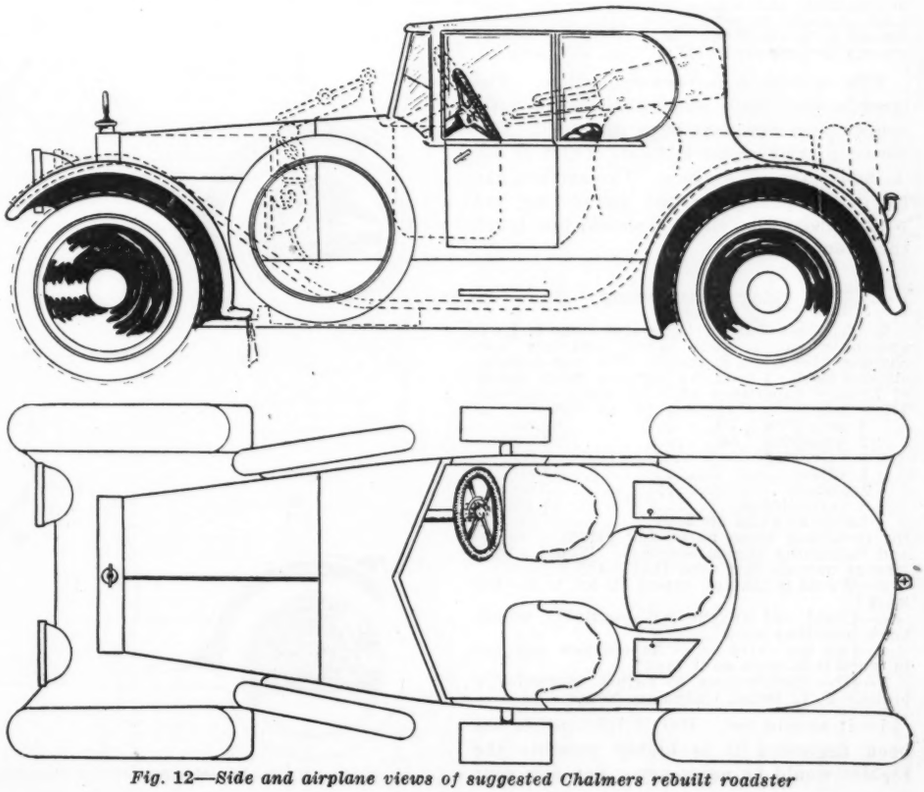


*Fig. 12—Side and airplane views of suggested Chalmers rebuilt roadster*

section. By reducing the wheel diameter you will reduce the gear ratio considerably. This will have the effect of cutting down speed but giving increased power. You will not be able to run the car as fast as before without danger of overdoing because of faster engine speed. If you wish to have the car as fast as before, you will have to change the driving pinion and ring gear to a smaller combination to give a higher gear ratio.

4—The Christensen starter is designed more for heavy-duty work, such as for use on tractors, unless the company brings out a small instrument, designed for cars.

### Reo as Speedster

Q—How can a 1916 Reo touring car be changed into a speedster?—Robert Kellams, Rockport, Ind.

This is shown in Fig. 13.

### Willys-Knight Speedster

Q—Publish suggestion for converting a 1916 Willys-Knight 84B into a speedster without going to a big expense. In doing this lower the steering wheel. The car is equipped with wire wheels. I would want to use stock radiator, hood and fenders.—J. Minor Ewing, Minneapolis, Minn.

Converting the body style like this will cost from $150 to $300, depending on who does the work, yourself or a body builder. A suggestion is shown in Fig. 14.

## Lubrication

### Oiling of 1912 Everitt

Q—I have for repair a 1912 Everitt 30, four-cylinder engine. There may be part of the oiling system lost. Does the steel ball in the bottom of the oil container go above spring or below? I placed the ball on top of the spring and poured cylinder oil in the oil box. It did not flow into crankcase until I placed filler plug on oil box. Then the stem that is fastened to the oil plug pressed the ball down and let the cylinder oil flow into the crankcase. After the crankcase gets full to a certain level and the engine is not running the oil stops flowing until I start the engine and then keeps flowing as long as there is any in the oil box. This gets too much oil in crankcase and causes fouled plugs and quite a bit of smoke from exhaust. How deep should the oil be in the crankcase? Is the oil feed by gravity or pressure?—H. M. Cole, Fillmore, Ill.

This system is a vacuum system. The trouble with your oiler is that the little copper feed pipe has been deranged. Examine it, and adjust it so its center is $3\frac{3}{16}$ in. below the oil surface. The surface can be determined from the connecting rod when down. The oil level should just touch the connecting rod.

### May Be Oil Pump

Q—I have a Buick D45, bought June 6, 1917, and have run it 4925 miles. Oil has been changed nine times in engine. The best cylinder oil was used. I took the car to a Buick expert of 7 years' experience with the Buick company. These are the new parts he put in engine:

| | |
|---|---|
| 4 wristpins, .70 | $2.80 |
| 8 wristpins, .50 | 4.00 |
| 1 valve cage | 3.00 |
| 1 valve | 1.80 |
| 2 pistons | 5.00 |
| 8 valve lifters | 11.40 |
| Labor at $1.25 an hour | 37.20 |

for installing these parts and grinding valves and tightening engine bearings. Would an engine as new as that need that many repairs?

2—Would it take an expert 29 hr. to do that work?

3—Could not anyone with ordinary ability have done that work?

4—Can the valve roller have a new axle put in when it is worn so it taps?

5—Give instructions to adjust transmission brake.—F. L. Baird, Chapman, Neb.

1—It should not. But if lubrication has been neglected it is highly possible the repairs would be necessary. You say your oil has been changed nine times in 4925 miles, or an average of once per 550 miles. This should be enough, but, has the oil pump been operating? If not, your trouble is there.

2—This time is not excessive.

3—Ordinary ability does not correspond with a trained mechanic's ability, when applied to mechanic's work.

4—Yes.

5—The two screws on the toggle bolts that tighten up the tension on the spring are the means for adjustment. If these nuts will not do the adjusting, then the lining is worn.

## Carburetion

### Blaming the Carbureter

Q—All other things being equal, would it be possible to get better carburetion from a Sunderman carbueter than a Marvel on a Buick D45?

2—Will the fine screen used between the manifold and carbueter help carburetion any?

3—The front cylinder scored a little on one side when the oiling system stopped. Which is best a new cylinder block, a block from a wrecking company or having this cylinder wall welded by the silver nickel alloy process advertised in your columns?

4—Name four or five of the most successful piston rings.—W. J. Rapp, San Jose, Ill.

1—There are so many things to be taken into consideration relative to carburetion it is almost impossible to give a satisfactory answer to many questions, and this is one of them. It is not quite fair to any engine to lay its troubles to the carbureter, although this seems to be common practice. Poor compression, faulty ignition and a hundred and one things may have a bearing on the case, yet the carbureter is the first to be charged with all ills. Where a maker has come to use a particular carbureter, it is safe to presume its qualifications have been well considered, although this does not mean it might not be possible to find another that would do better work for that particular engine. But this can be told only by a series of tests and then when the entire engine is known to be practically perfect in every respect. No motor car maker would make a recommendation to himself in the matter of a carbureter until he had performed some experiments, and MOTOR AGE is in the same position, just as you will be. The Buick company probably would tell you the carbureter that came with the car will do all that could be expected of it if conditions are right.

2—Yes, under certain conditions, yet they are not necessary if engine conditions are right and carbureter adjustment is correct. It is true a gauze screen interposed between the carbureter and the intake manifold will tend to break up the fuel, but it is also true it will have a refrigerating effect and under certain conditions will cause frost to accumulate on the screen to the extent that the passage of the air and fuel will be seriously hampered, preventing a sufficient quantity from entering the combustion chamber.

3—If the cylinder is only slightly scored, perhaps it can be repaired, but it hardly would be advisable to buy a block from a wrecking company, for the chances are it would be in about the same condition as the rest of the car from which it came. If your cylinders have never been reground, it would be well to have them so treated and then fit oversize pistons. Your old cylinders are practically heat treated now and after being reground and fitted with oversize pistons will give splendid satisfaction if the work is properly done.

4—See advertising columns of MOTOR AGE.

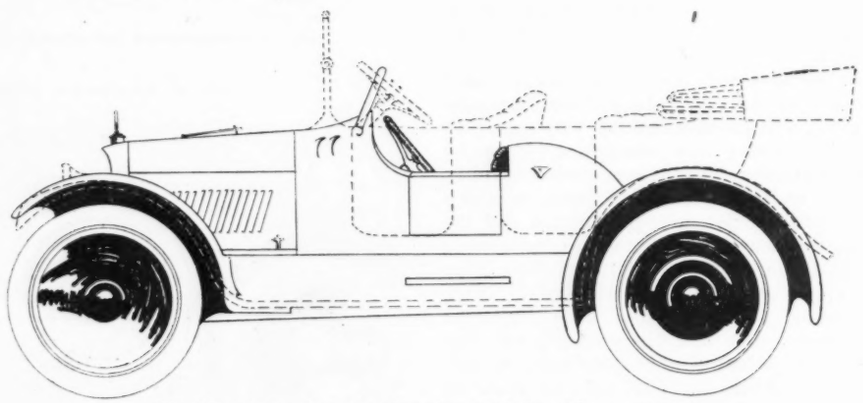


*Fig. 13—Suggestion for changing 1916 Reo into a speedster*

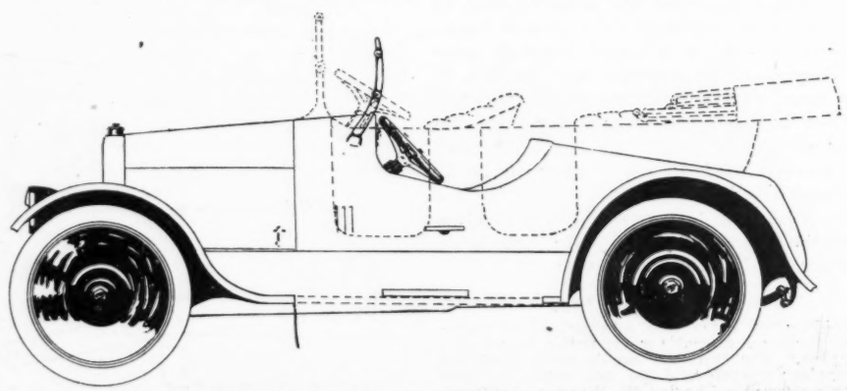
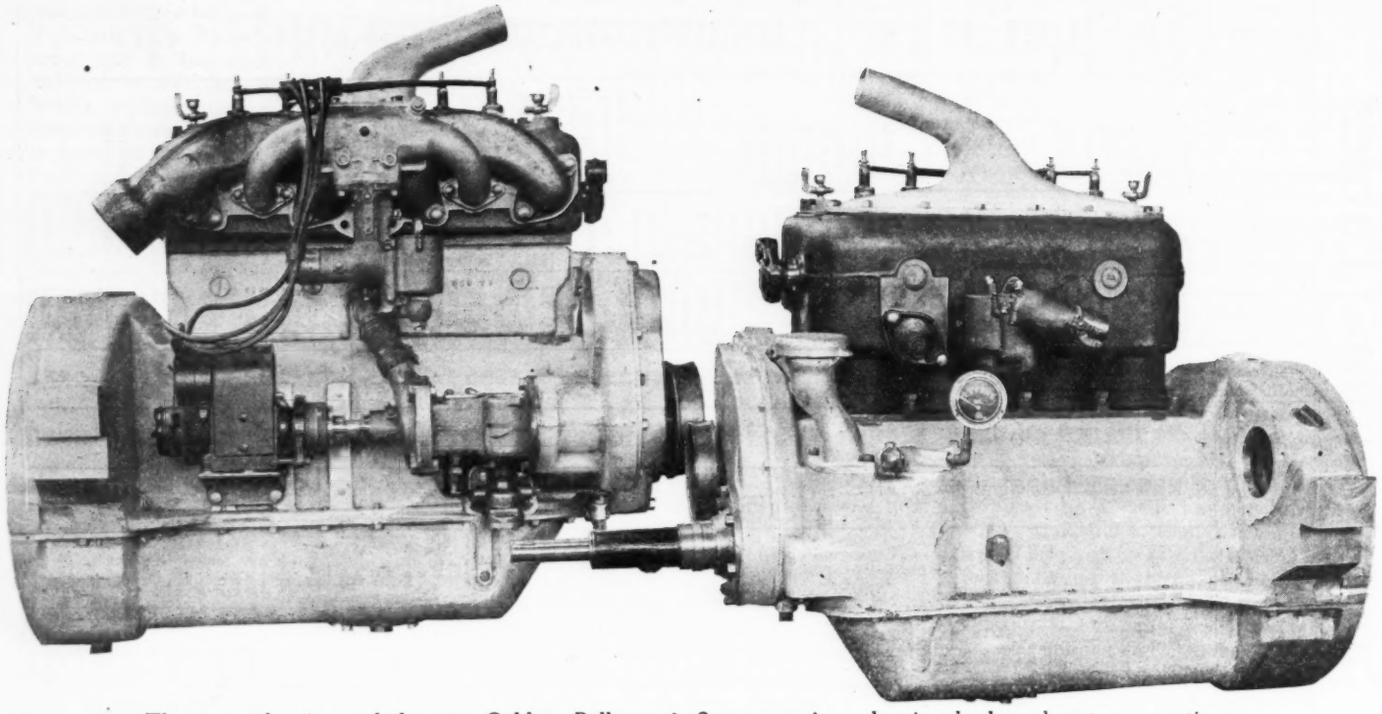


*Fig. 14—Suggestion for changing a Willys-Knight into a speedster*

# Motor Age Monthly Farm-Lighting Specification Tables

| Name and Model | Maker | Watts capacity | No. 20 watt lamps | Lamp voltages | No. cyl'd s | No. cycles | Make of engine | Horsepower | Fuel | Cooling | Power pulley | Generator drive | Make of generator | Make of battery | Battery amp. hours | Battery, volt | No. cells | Starting engine | Stopping engine | Governor, type | Price |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aerothrust | Aerothrust Engine Co., La Porte, Ind | .... | 15–25 | .... | 2 | 2 | ..... | 3 | ..... | Air | Opt. | Shaft | ..... | ..... | 60 | 28–42 | ..... | ..... | ..... | ..... | ..... |
| Alamo | Alamo Farm Light Co., Omaha, Neb | 1000 | 75–120 | 40 | 1 | 4 | Ide | 1¼ | ..... | Water | ..... | Direct | ..... | ..... | ..... | ..... | 16 | ..... | ..... | Throttle | ..... |
| Alco | Automatic Light Co., Minneapolis, Minn | 750 | 40 | 110 | 1 | 4 | Alco | 2 | G | Water | Opt. | Direct | GE Alco | Willard | 76 | 6 | 3 | Auto. | Auto. | Electro sole. | $ 375 |
| | | 850 | 55–75 | 32 | 1 | 4 | Alco | 2 | G | Water | Opt. | Direct | GE Alco | Willard | 80 | 32 | ..... | S-Auto. | Auto. | Electro sole. | 450 |
| Cushman, A | Cushman Motor Works, Lincoln, Neb | 1000 | 20–70 | 32 | 1 | 4 | Own | 4 | ..... | Water | Yes | Belt | Imperial | ..... | 80 | 32 | 16 | S Auto. | S auto. | Throttle | ..... |
| B | | 1000 | 25–75 | 32 | 1 | .. | Own | 4 | ..... | Water | Yes | Belt | Imperial | ..... | 180 | 32 | 16 | S Auto. | S auto. | Throttle | ..... |
| E | | 1000 | 50–100 | 32 | 1 | 4 | Own | 4 | ..... | Water | Yes | Belt | Imperial | ..... | 120 | 32 | 16 | S Auto. | S auto. | Throttle | ..... |
| Delco, ¾ KW, 32 volt | Domestic Engineering Co., Dayton, Ohio | 750 | 20–72 | 32 | 1 | 4 | Own | 1½ | K | Air | No | Direct | Own | Exide | 80–160 | 32 | 16 | S-Auto. | Auto. | Voltage | 425–490 |
| 3 KW, 32-volt | | 3000 | 150 | 32 | 1 | 4 | Own | 5 | K | Air | No | Direct | Own | Exide | 80–160 | 32 | 16 | S-Auto. | Auto. | Voltage | 900 |
| 3 KW, 110-volt | | 3000 | 150 | 110 | 1 | 4 | Own | 5 | K | Air | No | Direct | Own | Exide | 80–160 | 112 | 36 | S-Auto. | Auto. | Voltage | 1,200 |
| Dyneto, 5 | Dyneto Electric Co., Syracuse, N. Y | 600 | 20–42 | 32 | 1 | 4 | Novo | 1½ | ..... | Water | Opt. | Belt | Own | Willard | 53 | 32 | 16 | S-Auto. | S-Auto. | ..... | 385 |
| 7 | | .... | 16–54 | 32 | 1 | 4 | Novo | 1½ | ..... | Water | Opt. | Belt | Own | Willard | 80 | 32 | 16 | S-Auto. | S-Auto. | ..... | 410 |
| 9 | | .... | 23–65 | 32 | 1 | 4 | Novo | 1½ | ..... | Water | Opt. | Belt | Own | Willard | 110 | 32 | 16 | S-Auto. | S-Auto. | ..... | 460 |
| Fairbanks-Morse, F-3 hp | Fairbanks, Morse & Co., Chicago | 900 | 13–100 | 30 | 1 | 4 | Own | 3 | K | Water | ..... | Belt | Own | ..... | 66 | 32 | 16 | S-Auto. | Manual | ..... | ..... |
| F-6 hp | | 3500 | 40–200 | 30 | 1 | .. | Own | 6 | K | Water | ..... | Belt | Own | ..... | 200 | 32 | 16 | S-Auto. | Manual | ..... | ..... |
| Fairmont, B-4 | Fairmont Gas E. & R. M. Co., Fairmont, Minn | .... | 50 | 32 | 1 | 2 | Own | 4 | K & G | Water | Yes | Belt | W. E. | Edison | 80 | 32 | 24 | S-Auto. | Manual | Throttle | 595 |
| Garford | Garford Mfg. Co., Elyria, Ohio | 600 | 16–62 | 30 | .. | .. | Any | 2 | ..... | ..... | ..... | Belt | ..... | Gould | 80 | 32 | 11 | ..... | Manual | ..... | 320 |
| Genco, A | General Gas-Electric Co., Hanover, Pa | 500 | 6–43 | 30 | 1 | 4 | Own | 2 | Any | Water | Yes | Direct | Own | Own | 110 | 32 | 16 | S-Auto. | Auto. | ..... | ..... |
| B | | 600 | 10–59 | 30 | 1 | 4 | Own | 2 | Any | Water | Yes | Direct | Own | Own | 167 | 32 | 16 | S-Auto. | Auto. | ..... | ..... |
| Jones, A | L. B. Jones Co., Kansas City, Mo | 750 | 40 | .... | 1 | 4 | ..... | ..... | ..... | Water | ..... | Direct | ..... | ..... | ..... | ..... | ..... | S-Auto. | Auto. | ..... | ..... |
| Lalley | Lalley Electro-Lighting Co., Detroit | 1000 | 50 | 32 | 1 | 2 | Own | 1½ | G | Water | ..... | Direct | ..... | Willard | 115 | 32 | 16 | Manual | Manual | Throttle | 475 |
| Lauson-Edison, 201 | John Lauson Mfg. Co., New Holstein, Wis | 800 | 7–30 | 50 | 1 | 4 | Opt. | 2½ | Opt. | Water | Opt. | Belt | Own | Edison | 38 | 50 | 26 | Manual | Manual | Throttle | ..... |
| 202-30 | | 1400 | 16–50 | 50 | 1 | 4 | Opt. | 2½ | Opt. | ..... | Opt. | Belt | ..... | Edison | 75 | 52 | 26 | Manual | Manual | Throttle | ..... |
| 203–30 | | 2000 | 22–75 | 50 | 1 | 4 | Opt. | 3½ | Opt. | ..... | Opt. | Belt | ..... | Edison | 112 | 52 | 26 | Manual | Manual | Throttle | ..... |
| 206–110 | | 3500 | 27–154 | 125 | 1 | 4 | Opt. | 4½ | Opt. | ..... | Opt. | Belt | ..... | Edison | 38 | ..... | 94 | Manual | Manual | Throttle | ..... |
| Lauson Junior, 300 | | 500 | 10–25 | 30 | 1 | 4 | Opt. | 1½ | Opt. | ..... | Opt. | Belt | Own | ..... | 40 | 30 | 15 | Manual | Manual | Throttle | ..... |
| 301 | | 800 | 15–40 | 30 | 1 | 4 | Opt. | 1½ | Opt. | ..... | Opt. | Belt | Own | ..... | 60 | 30 | 15 | Manual | Manual | Throttle | ..... |
| Langstadt-Meyer, 6 | Langstadt-Meyer Co., Appleton, Wis | 600 | 30–45 | 32 | 1 | 4 | L-M | 3 | G | Water | Yes | Belt | L-M | ..... | 80 | 32 | 16 | S-Auto. | Manual | Throttle | 576 |
| 6½ | | 1200 | 75 | 32 | 1 | 4 | L-M | 3 | G | Water | Yes | Belt | L-M | ..... | 80 | 32 | 16 | S-Auto. | Manual | Throttle | 606 |
| 7 | | 960 | 72 | 32 | 1 | 4 | L-M | 3 | G | Water | Yes | Belt | L-M | ..... | 107 | 32 | 16 | S-Auto. | Manual | Throttle | 650 |
| Main, 25-30 volt | Main Electric Mfg. Co., Pittsburgh, Pa | 600 | 25–41 | 30 | 1 | 4 | Own | 1½ | Opt. | Water | Yes | Belt | Own | ..... | 60 | 30 | 15 | Manual | Manual | ..... | 375 |
| 40 | | 800 | 40–56 | 30 | 1 | 4 | Own | 1½ | Opt. | Water | Yes | Belt | Own | ..... | 95 | 30 | 15 | Manual | Manual | ..... | 400 |
| 50 | | 1000 | 50–66 | 30 | 1 | 4 | Own | 2½ | Opt. | Water | Yes | Belt | Own | ..... | 95 | 30 | 15 | Manual | Manual | ..... | 360 |
| 75 | | 1500 | 22–97 | 30 | 1 | 4 | ..... | 3½ | Opt. | Water | Yes | Belt | Own | ..... | 130 | 30 | 15 | Manual | Manual | ..... | 390 |
| 50 | | 1000 | 25–75 | 110 | 1 | 4 | ..... | 2½ | Opt. | Water | Yes | Belt | Own | ..... | 40 | 110 | 55 | Manual | Manual | ..... | 575 |
| 75 | | 1500 | 38–113 | 110 | 1 | 4 | ..... | 3½ | Opt. | Water | Yes | Belt | Own | ..... | 60 | 110 | 55 | Manual | Manual | ..... | 680 |
| 100 | | 2000 | 60–160 | 110 | 1 | 4 | ..... | 3½ | Opt. | Water | Yes | Belt | Own | ..... | 95 | 110 | 55 | Manual | Manual | ..... | 720 |
| Marco | Marmon-Chicago Co., Chicago | 1250 | 85–100 | 32 | 1 | 4 | Newway | 4 | Opt. | Air | Yes | Chain | Dyneto | Perf't'n | ..... | 32 | 11 | S-Auto. | ..... | Electro-mag. | 595 |
| Matthews, A | Matthews Engineering Co., Sandusky, Ohio | 1000 | 50 | 32 | 1 | 4 | Own | 3 | G | Water | No | Direct | G-E | Willard | 72 | 32 | 16 | Auto. | Auto. | Electro-mag. | 795 |
| A-1 | | 1000 | 50 | 32 | 1 | 4 | Own | 3 | G | Water | No | Direct | G-E | Willard | 72 | 32 | 16 | S-Auto. | Auto. | Electro-mag. | 695 |
| B | | 2000 | 100 | 32 | 2 | 4 | Own | 7 | G | Water | No | Direct | G-E | Willard | 144 | 32 | 16 | Auto. | Auto. | Electro-mag. | 1,350 |
| B-1 | | 2000 | 100 | 32 | 2 | 4 | Own | 7 | G | Water | No | Direct | G-E | Willard | 144 | 32 | 16 | S-Auto. | Auto. | Electro-mag. | 1,250 |
| C | | 1000 | 50 | 110 | 1 | 4 | Own | 3 | G | Water | No | Direct | G-E | ..... | ..... | ..... | ..... | Manual | Manual | Electro-mag. | 775 |
| | | 2000 | 100 | 110 | 2 | 4 | Own | 7 | G | Water | No | Direct | G-E | ..... | ..... | ..... | ..... | Manual | Manual | Electro-mag. | 1,300 |
| Mayhew, K 1 | Mayhew Co., Milwaukee, Wis | 800 | 12–40 | 32 | 1 | 4 | ..... | ..... | G | Water | Yes | Direct | Western | ..... | 80 | 32 | 16 | S-Auto. | Manual | Flyball | 475 |
| K 2 | | 800 | 16–48 | 32 | 1 | 4 | ..... | ..... | G | Water | Yes | Direct | Western | ..... | 125 | 32 | 16 | S-Auto. | Manual | Flyball | 510 |
| K 3 | | 800 | 22–54 | 32 | 1 | 4 | ..... | ..... | G | Water | Yes | Direct | Western | ..... | 160 | 32 | 16 | S-Auto. | Manual | Flyball | 550 |
| Mor-Lite | Fairbanks, Morse & Co., Chicago | .... | 15–40 | 30 | 1 | ..... | ..... | ..... | G | Water | ..... | Direct | ..... | ..... | ..... | 32 | 16 | S-Auto. | Auto. | Electro mag. | ..... |
| Owen | R. M. Owen & Co., New York | 1250 | 100 | 32 | 1 | 4 | Own | 1¼ | G | Water | No | Direct | ..... | ..... | 80 | 32 | 16 | S-Auto | Auto. | ..... | ..... |
| Perfection, SA 1 | Perfection Storage Battery Co., Chicago | 1500 | 75 | 32 | 1 | 4 | ..... | 3 | Opt. | Water | ..... | Direct | ..... | Own | 80 | 32 | 16 | S-Auto. | Auto. | ..... | 600 |
| FA 6 | | 1500 | 65 | 32 | 1 | 4 | ..... | 3 | Opt. | Water | ..... | Direct | ..... | Own | 40 | 65 | 32 | Auto. | Auto. | ..... | 800 |
| Powerlite, 163 L 65 | Montgomery Ward & Co., Chicago | 650 | 20 | 32 | 1 | 4 | Own | 2½ | G | Water | Yes | Direct | Own | Own | 60 | 32 | 16 | S Auto. | Manual | Throttle | 348 |
| 163-L 67 | | 650 | 31 | 32 | 1 | 4 | Own | 2½ | G | Water | Yes | Direct | Own | Own | 90 | 32 | 16 | S-Auto. | Manual | Throttle | 365 |
| 163-L 69 | | 650 | 41 | 32 | 1 | 4 | Own | 2½ | G | Water | Yes | Direct | Own | Own | 120 | 32 | 16 | S-Auto. | Manual | Throttle | 380 |
| Rohaco, Unit | Roberts-Hamilton Co., Minneapolis, Minn | 1500 | 75 | 32 | 1 | 4 | Own | 3 | Opt. | Water | Yes | Direct | ..... | Opt. | 75–100 | 32 | 16–24 | S-Auto. | Manual | Flyball | ..... |
| A-1 | | 500 | 13–40 | 40 | 1 | 4 | Own | 1½ | Opt. | Water | Yes | Belt | ..... | ..... | 60 | 30 | 15 | S-Auto. | Manual | Flyball | *250 |
| BE-1 | | 800 | 30 | 50 | 1 | 4 | Own | 2 | Opt. | Water | Yes | Belt | ..... | Edison | 75 | 50 | 24 | S-Auto. | Manual | Flyball | *500 |
| BE-2 | | 1400 | 32–80 | 50 | 1 | 4 | Own | 3 | Opt. | Water | Yes | Belt | ..... | Edison | 113 | 50 | 24 | S-Auto. | Manual | Flyball | *600 |
| B-3 | | 2000 | 24–120 | 40 | 1 | 4 | Own | 5 | Opt. | Water | Yes | Belt | ..... | ..... | 120 | 32 | 16 | S-Auto. | Manual | Flyball | *490 |
| BE-3 | | 2000 | 100 | 50 | 1 | 4 | Own | 5 | Opt. | Water | Yes | Belt | ..... | Edison | 150 | 50 | 24 | S-Auto. | Manual | Flyball | *750 |
| Swanlite | Black Swan Co., Waseca, Minn | 1000 | 50–100 | .... | 1 | 4 | Own | 3 | Opt. | Water | No | ..... | ..... | ..... | 60–160 | 32 | 16 | ..... | ..... | ..... | 385–465 |
| Swartz-Unit | Swartz Electric Co., Indianapolis, Ind | 1000 | 50 | 30 | 1 | 2 | Own | ..... | G | Water | No | Direct | Own | Opt. | 88 | 32 | 16 | S-Auto. | Manual | Electro-mag. | ..... |
| E | | 1500 | 50 | 30 | 1 | 4 | Own | ..... | Opt. | Water | Yes | Belt | Own | Opt. | 88 | 32 | 16 | Manual | Manual | Flyball | ..... |
| F | | 2000 | 100 | 60 | 1 | 4 | Own | ..... | Opt. | Water | Yes | Belt | Own | Opt. | 88 | 64 | 32 | Manual | Manual | Flyball | ..... |
| Syco | Beaudette & Graham Eng. Co., Boston, Mass | 1000 | 62-70 | 32 | 1 | 4 | Own | 3 | G | Water | Yes | Direct | ..... | ..... | 90-160 | 32 | 16 | S-Auto. | Throttle | ..... | ..... |
| | | 4000 | 240-310 | 110 | 4 | 4 | Own | 8 | G & K | Water | No | Direct | ..... | ..... | 60-160 | 110 | 52 | S-Auto. | S-Auto. | ..... | ..... |
| Uni-Lectric | Uni-Lectric Corp., Detroit | 660 | 33 | 110 | 1 | .. | Own | ..... | ..... | Water | ..... | Direct | Own | ..... | 80 | 6 | 3 | S-Auto. | ..... | ..... | 472 |
| Universal, 1-KW | Universal Products Co., Oshkosh, Wis | 1000 | 150 | 32 | 1 | 4 | Own | ..... | G | Water | ..... | Direct | ..... | ..... | 80-130 | 32 | ..... | S-Auto. | Auto. | ..... | 435-495 |
| 4-KW | | 4000 | 200 | 32 | 1 | 4 | Own | ..... | G | Water | ..... | Direct | ..... | ..... | 130 | 32 | ..... | S-Auto. | Auto. | ..... | 975 |
| West. Elect., 15-DC-90 | Western Electric Co., New York | 1500 | 75 | 32 | 1 | .. | Own | 3¼ | K | Air | Yes | Direct | Own | ..... | 90 | 32 | 16 | S-Auto. | Auto. | Throttle | ..... |
| 15-DC-180 | | 1500 | 100 | 32 | 1 | .. | Own | 3¼ | K | Air | Yes | Direct | Own | ..... | 180 | 32 | 16 | S-Auto. | Auto. | Throttle | ..... |
| Winton | Winton Eng. Works, Cleveland, Ohio | 5000 | 250 | 115 | 4 | 4 | Own | ..... | ..... | Water | ..... | Direct | Own | Opt. | Opt. | Opt. | Opt. | Opt. | ..... | ..... | ..... |
| Wisconsin, 15-light | Lauson-Lawton Co., De Pere, Wis | 450 | 12 | 30 | 1 | .. | Own | 2½ | ..... | Water | Yes | Belt | Own | ..... | 36 | 26 | 13 | Manual | Manual | ..... | ..... |
| 30-light | | 600 | 24 | 32 | 1 | .. | Own | 2½ | ..... | Water | Yes | Belt | Own | ..... | 36 | 32 | 16 | Manual | Manual | ..... | ..... |
| 50-light | | 800 | 40 | 32 | 1 | .. | Own | 2½ | ..... | Water | Yes | Belt | Own | ..... | 60 | 32 | 16 | Manual | Manual | ..... | ..... |
| • 100-light | | 1500 | 80 | 32 | 1 | .. | Own | 4 | ..... | Water | Yes | Belt | Own | ..... | 100 | 32 | 16 | Manual | Manual | ..... | ..... |

*Without engine. Opt., optional. S-Auto., semi-automatic. K, kerosene. G, gasoline. Electro-mag., electro-magnetic.



The two side views of the new Golden, Belknap & Swartz engine, showing both carbureter mountings

# New Engine for Trucks and Tractors

## Accessibility Is Feature of Latest Golden, Belknap & Swartz

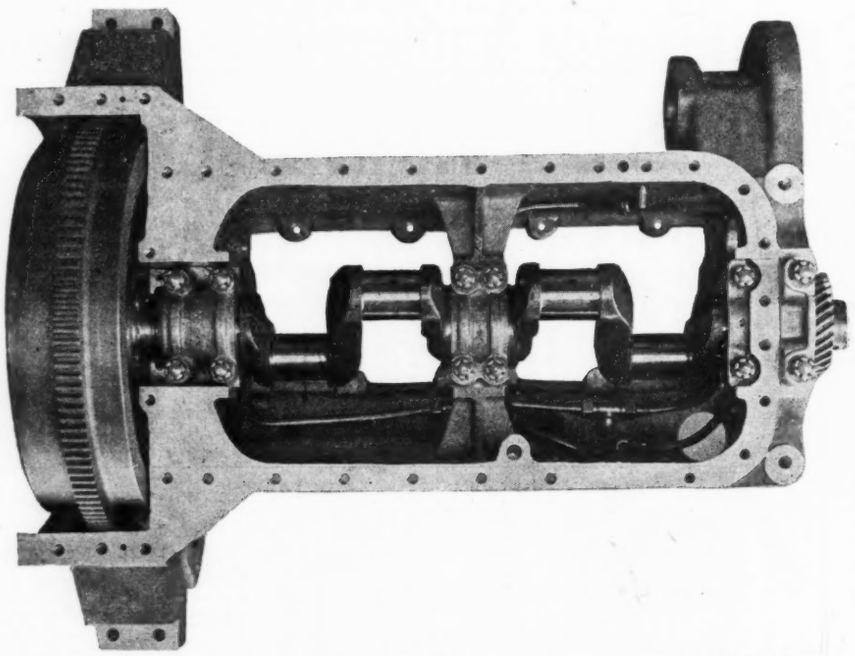
A NEW truck and tractor engine is being brought out by the Golden, Belknap & Swartz Co., Detroit. The engine is a 3¾ in. by 5 in. four-cylinder known as the AA and designed to handle low-grade fuel. It is a new product in every respect and incorporates the most up-to-date features of design, especially from the standpoint of service. Metal has been used liberally, but its use has not made the engine bulky. Durability and prolonged service seem to have been in the minds of the designers more than anything else.

The engine is laid out so it adapts itself to trucks and tractors and will fit the individual requirements of the various chassis. As an example, the carbureter can be mounted on either side. Thermosyphon or pump water circulation can be employed, and battery or magneto ignition is suitable, driving facilities being arranged to take care of either. If the engine is used in tractor service, an oil cooler can be fitted, and if it is desired to mount a governor, there is a vertical shaft with a slotted end to take the governor drive and a flange face upon which to mount it. The engine is a fixed-head type with removable water header. Both halves of the crankcase are of aluminum, and the cylinders are cast in a single block of gray iron.

**Construction of Piston**

The piston has cut in it two annular grooves, together with drilled holes, which act as oil retainers and serve to keep the oil from working by the piston, thereby eliminating spark plug fouling. The piston pin is anchored in the boss, and the weight of the piston complete with wrist pin is 3 lb. 1 oz. The length of the piston is 3¾ in. The wristpin bearing is 1½ in. wide and 1 in. in diameter. These large bearings seem ample to eliminate loose bearing trouble.

Lubrication is by full pressure system, with no splash. The oil pump is driven off the water pump shaft and is a gear type. It is mounted outside and thus can be removed readily for inspection. The pump delivers oil under pressure regulated to suit requirements as regards pressure. There is provision for mounting the oil gage on the dash. This is shown short connected in the illustration. The pump has a regulation feature that is very accessible. It permits of the regulation of the oil pressure with a screwdriver and a small wrench.



This view of the Golden, Belknap & Swartz truck and tractor engine shows the main bearings

This device is seen in the illustration to the left of the gage and on the cap of the oil filler neck.

Under ordinary conditions the oil is fed under pressure of 15 lb. a square inch. The oil leads are self-contained, taking oil from the pump direct to each one of the main bearings and another lead for pressure to the pressure gage. The crankshaft is drilled through the cheeks to the crankpin, which is drilled to feed the oil to the lower connecting rod bearing. As the oil is fed under pressure and supplied to the bearings in quantity, there is a marked spray off the lower end of the connecting rod which lubricates the cylinder walls. In ordinary practice the engine oil is cooled by pump circulation. The bottom portion of the crankcase being aluminum, considerable heat is radiated. The rapid circulation of the oil, together with heat lost in the crankcase, insures a cool supply of oil.

The main bearings and the crank bearing of the connecting rod are novel in construction in that they use no shims for adjustment, but use the Muzzy-Lyon babbitt adjustment. This is a solid piece of babbitt metal of the thickness of the ordinary group of shims, but with the advantage that it can be inserted beyond the inside of the bearing and then burnished out to form a part of the true bearing surface, eliminating the ordinary outlet for oil in the shimmed bearing. When necessary to adjust the bearings the babbitt can be filed down to any amount, permitting very accurate settings of the bearings.

The main bearings are supported in the crankcase, the center bearing being very heavily ribbed to give the desired stiffness and continuity of alignment. Each of the main bearings is held in place by four alloy steel stub bolts with castellated nuts, cotter-pinned into position. The timing gears are helically cut and are steel against semi-steel. The camshaft is on the right side of the engine and is an integral forging with exceptionally large bearings.

The course of the intake gases depends on the side of the engine on which the carbureter is mounted. When the mounting is on the right side, the hot spot manifold is used with the intake partially integral with the exhaust, securing the necessary pre-heating effect. If the carbureter is mounted on the other side, the intake passes between the cylinder blocks. It then is carried around by an elbow to the upper inlet passage and thence into the cylinders. Practically all the intake manifolding is contained within the castings.

No accessories are furnished with the engine, but the engine itself is designed to take all that usually is mounted on the truck, the tractor, or car powerplant. The mounting is three-point suspension, and the over-all dimensions are 34 1/16 in. long by 31 in. high by 23 1/8 in. wide.

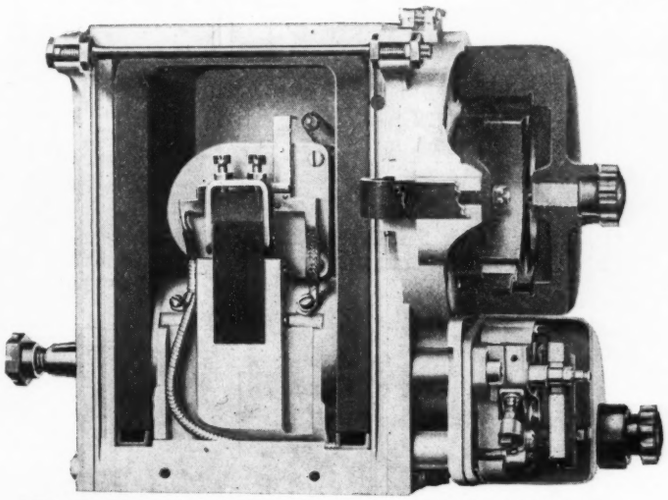
The engine is produced with three S. A. E. bell housings as standard. The starting motor is provided for in that the flywheel is equipped with cut teeth for the starter pinion. There is a generator mounting of the timing gear housing on the right side of the engine, if the magneto is used, or, if the magneto is not used, the generator can be mounted on the shelf in place of the magneto. These locations for mountings of the auxiliaries give the engine a very elaborate and elastic make-up for truck, tractor or passenger car purposes.

The general power characteristics of the engine from tests on the fan dynamometer give 42 hp. at 1600 r.p.m., with the maximum torque at 800 r.p.m. The governed speed is 1400 r.p.m. The weight of the engine without the ignition system and the carbureter is 410 lb.

# Splitdorf Aero Magneto Now on Market

## Increased Sturdiness Is Feature

THE Splitdorf Electrical Co. is bringing out a new series of magnetos known as the Aero type and adapted to cars and trucks. A single square carbon brush is used, and there is a general increase in sturdiness, the interrupter points particularly being heavier. The gears are of a material known as Micarta and the distributer board is of Americanite, a new insulating substance developed by Splitdorf and made in its factory for use exclusively on Splitdorf products.



**This shows housing of stationary winding in Splitdorf so it is protected from dirt and moisture**

The Mason principle of stationary windings and revolving field is retained, and the new instrument is uni-directional. Since the magneto is an alternating-current generator, it produces its current in the form of positive and negative waves. One wave series always is stronger than the other, and in the Areo magneto it is the negative, which is utilized as the spark-producing wave. These waves flow always in one direction through the instrument and the spark plugs. In the Aero magneto the breaker-operating cam has two lobes, and the rotor has four wings.

The other changes do not in any way alter the principle of operation of the Aero magneto. For those who are not acquainted with this instrument, it differs principally from the ordinary magneto in that, instead of having a revolving winding, it has a stationary winding. The revolving portion of the instrument consists of a shaft on which are two pieces, called wings, of magnetic material separated by a center piece of non-magnetic material. This shaft, instead of extending between the poles of the magneto, extends from one pole of the magnet to the other. The wings constitute rotating poles, because they are in contact with the magnet poles. Instead of a rotating armature two field pieces partly surround the shaft, these pieces being really continuations of the laminated core of the winding housed on the arch of the magnet.

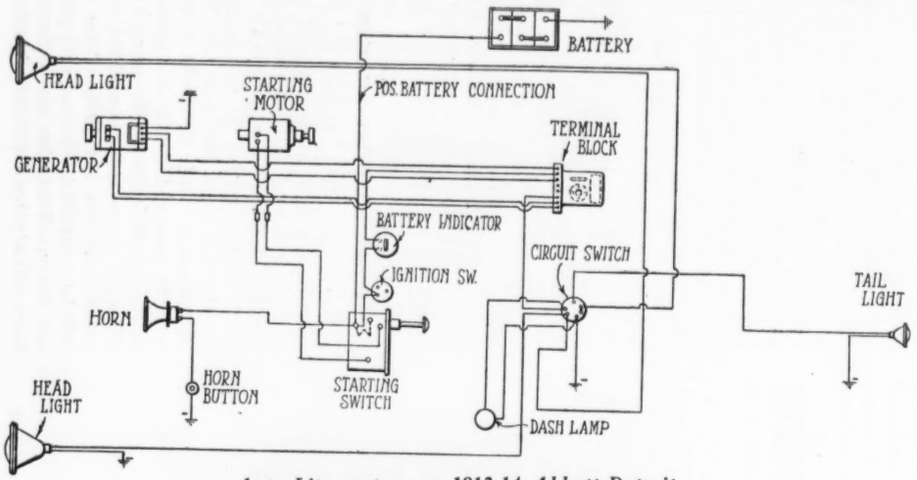
The field thus is securely hidden from dust and dirt and its core extended to afford the magnetic lines of force a path. The rotating poles are always of the same polarity, because they are in contact with given poles of the magnet. As they revolve they brush the field pieces, thus breaking the magnetic circuit and causing a current to be produced in the primary winding. The remainder of the operation of the induction of the secondary, etc., is conventional. The condenser is mounted directly above the winding and, like all the interior parts, is accessible by removing two screws.

Some of the advantages claimed for this type of construction over the revolving armature are: Simplicity; fewer parts; complete protection to all parts; ease of adjustment even while magneto is operating; no wire on any revolving part; no change of polarity in the rotating member; the same high spark intensity regardless of spark lever position; reduced amount of iron in the field; quick break with unnecessary lag avoided and hence, a hot spark.

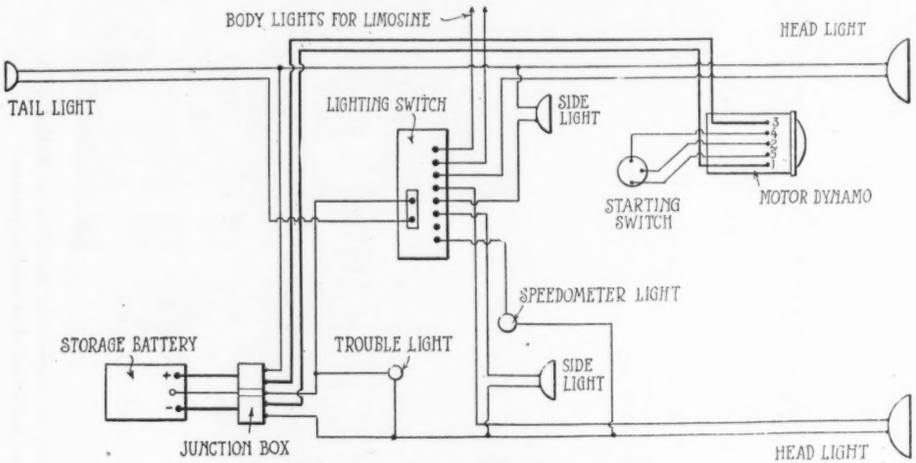
### TOTAL OUTPUT SPOKEN FOR

Eau Claire, Wis., March 17—Forty-two distributers from all sections of the country who attended the first annual sales convention of the Gillette Rubber Co. here last week contracted for the maximum number of tires and tubes the plant will be able to manufacture until Dec. 31. The total amount involved by the contracts is estimated at $3,500,000. To meet additional demands from the same distributers and other customers, it is believed the company will be compelled to enlarge its plant without delay. Tentative plans for additions have already been completed.

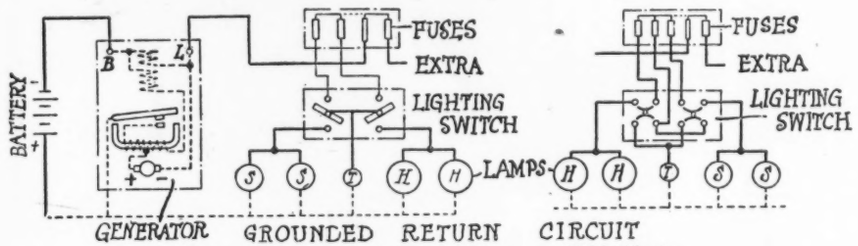
# Motor Age Wiring Diagram Chart No. 20



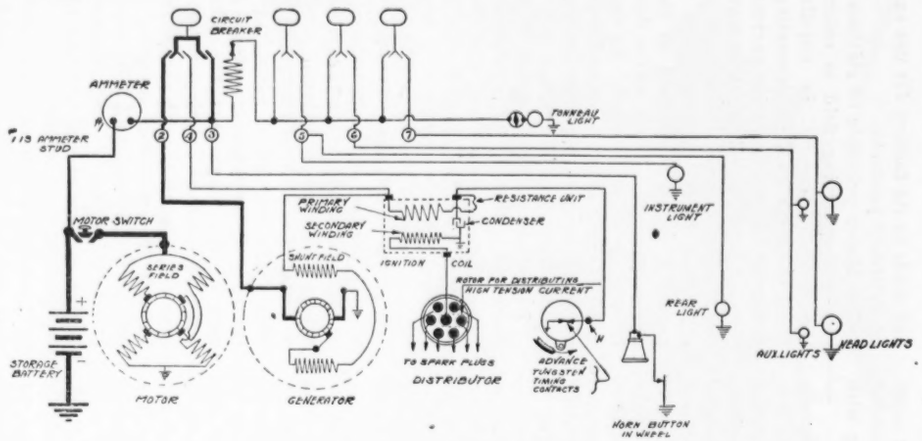

*Auto-Lite system on* 1913-14 *Abbott-Detroit*




*North East system on* 1913 *Michigan* 40

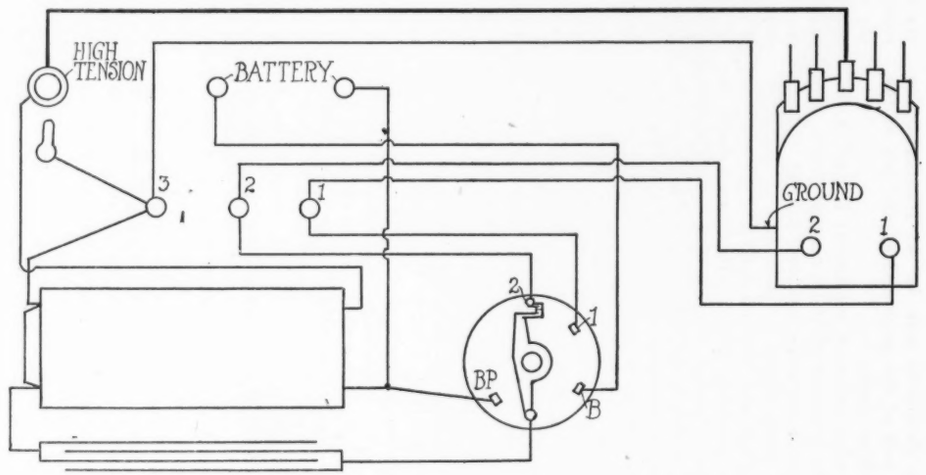



*Schematic wiring of Westinghouse on* 1914 *Marion*




*Delco system on the* 1917 *Paterson*

| | | |
|---|---|---|
| Alter—Nov. 14 | Elgin—Feb. 27 | Maxwell—Jan. 16 |
| Apperson—March 6 | Empire—March 13 | Mercer—Jan. 23 |
| Buick—Nov. 21 | Ford—Jan. 30 | Mitchell—Jan. 9 |
| Cadillac—Dec. 19 | Grant—Feb. 27 | Oakland—Jan. 2 |
| Case—Feb. 27 | Hudson—Dec. 5 | Oldsmobile—Jan. 23 |
| Chalmers—Feb. 20 | Hupmobile—Feb. 13 | Overland—Nov. 7-14 |
| Cole—Jan. 23 | Interstate—March 13 | Regal—Feb. 6 |
| Chevrolet—Nov. 28 | Krit—Feb. 6 | Reo—Feb. 27 |
| Detroiter—March 6 | Locomobile—Jan. 23 | Scripps-Booth—Dec. 26 |
| Dodge—Dec. 12 | Marion—March 6 | Studebaker—Dec. 26 |
| Dort—March 13 | Marmon—Jan. 9 | |




*Briggs magneto and coil ignition system on the Little*

# New Chicago Car to Be Custom Built for Trade

THE A. J. Meyer Corp., Chicago, is a new entry into the field. The concern will make a ½-ton delivery truck, a 1-ton truck and a passenger car. The car will not be manufactured in quantity but will be made only upon order. The trucks and the passenger car embody several new features, among them an airless tire mounted on a cushion hub. A new transmission has been developed in which the gears revolve only when in use. The gears are shifted by pressing a small foot lever, and the mechanical arrangement of the levers is automatically operative with the clutch, the clutch being allowed to engage only after the gears are in their desired position.

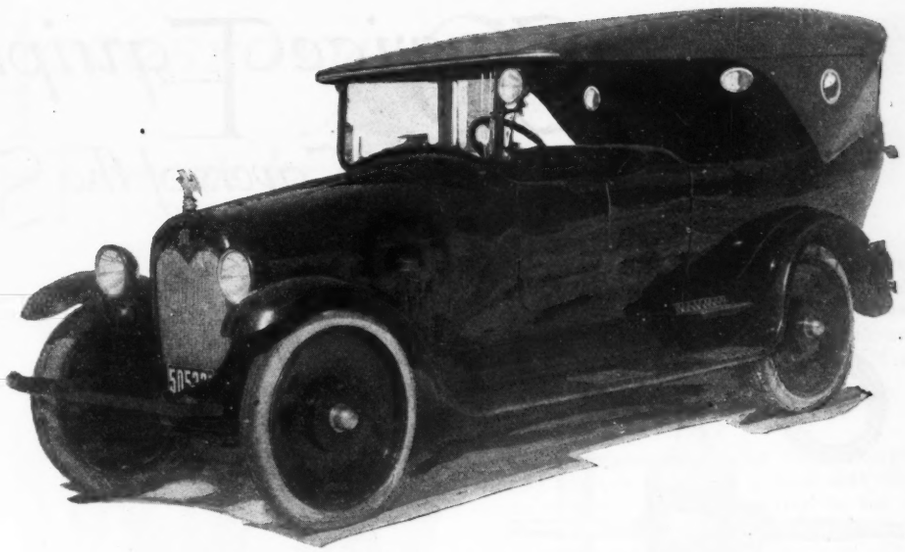
The most unusual departure from present-day practice is the wheel. The wheel itself is of pressed steel and is welded to the shell of the hub. Inside the hub shell are the collar and the bearings, just as in any other wheel, but between the hub shell and the bearing color is an unusual construction of rubber wedges. Any wheel in striking a bump in the road receives a blow. The pneumatic-equipped wheel tends to iron out these road bumps and hammer blows, and together with the springs the only result is a gentle up and down sway.

In the Meyer wheel the rubber wedges in the hub are so constructed and arranged that they can be forced in one direction only, longitudinally. This construction tends to resolve the force of a blow into two components, one horizontally, in the direction of the car's motion, and the other vertically. The horizontal component is taken up by the hub of the wheel, and since its force in comparison with the weight of the car is small, this horizontal component of the force is absorbed. The vertical component of the force is absorbed partly by the tire and by the springs so that before the bump reaches the passengers its force practically has been removed.

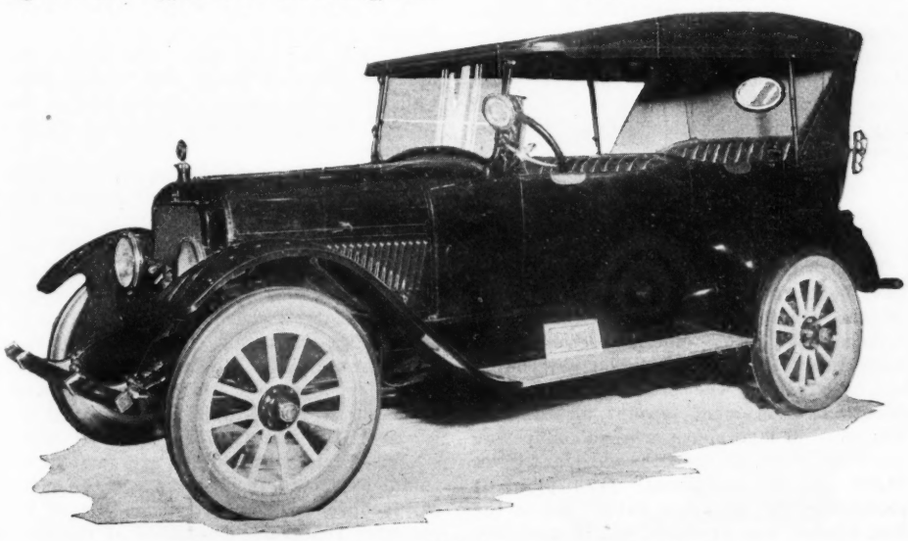
The tire is not pneumatic, but it is hollow. Its resisting power is in the construction. Two hollow sections divided by a supporting wall are supported on the casing, with a groove directly above the supporting wall forming two running surfaces directly above the side walls of the casing. A passenger car equipped with these wheels and tires gave ununusual mileage. A Pierce-Arrow truck, which formerly obtained 15,000 miles on its front tires, equipped with this tire gave 30,000 miles.

The gears are shifted mechanically. In starting up the engine is started as in any car, and in speeding up the action is also similar. Here the similarity ceases. If the car is brought to a stop with the emergency brake, the transmission automatically is set in starting speed and the clutch is held disengaged. Upon release of the emergency brake the car moves forward under low gear. A small foot pedal is pressed, and the car is in running speed or in any gear desired. In going from high to reverse, for example, disengaging the clutch automatically engages the gears. A small foot pedal is pressed, shifting the gears automatically through first and allowing the reverse element to be engaged, even though the car is in forward motion and no harm is done. If when the car is the second speed it is desired to go into neutral, it can be done without disengaging the gears.

(*Concluded on page* 44)



Note wheels on this car, which is the Meyer



The Highlander car, which is made at Kansas City

# Highlander Car Is Made of Standard Units

THE Highlander car, which is the product of the Midwest Motor Co., Kansas City, Mo., is assembled from standard units such as Continental six-cylinder engine, Delco electric system, Rayfield carbureter, Timken rear axles, bearings and brakes, Borg & Beck clutch, Stewart-Warner vacuum feed and Gemmer steering gear. The company expects to bring out a line of three models during the first year of production, which will consist of a sport model and a five-passenger and seven-passenger. Closed bodies will be built on special order only the first year. Trucks adapted to farm or city work are to be added.

Lubrication is by combination splash and forced feed. The system includes an oil gage on the engine base and an oil pressure gage on the instrument board. Cooling is by centrifugal pump, a ball bearing fan and honeycomb radiator.

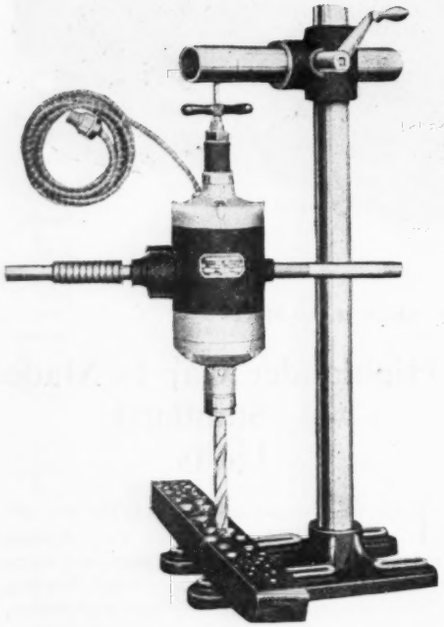
Bendix drive is employed, and the transmission is selective sliding gear. The frame is of heavy channel section pressed steel 4½ in. deep and 2-in. flange V-type. Springs are semi-elliptic.

Artillery wheels 34 in. in diameter, with wire wheels extra, are fitted with 34 by 4 tires. The wheelbase is 120 and 125 in. and the tread, 56 in. Options in color are given on the upholstering, which is of leather. A one-man top with dust cover, quick-adjustable curtains, rain-vision windshield, Stewart-Warner speedometer, electric horn, lock on ignition switch and gasoline gage are included in the equipment.

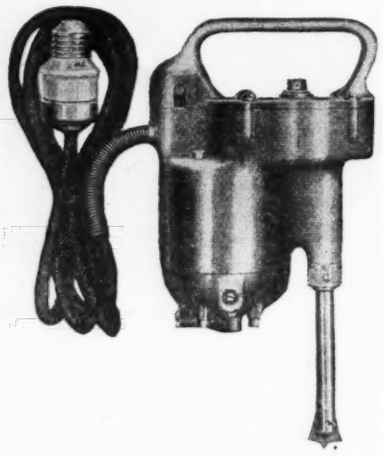
This car is being assembled at the old Stafford plant in Kansas City. The company was organized about eighteen months ago but was delayed in getting into production by war conditions. Not only has the Stafford property been purchased but the entire plant of the Frankfort Motor Car Co., Indianapolis, Ind., was acquired and moved to Kansas City. The company is headed by P. M. Crone, and J. A. Fullerton is vice-president and general manager.

*Schematic wiring of Westinghouse on 1914 Marion*

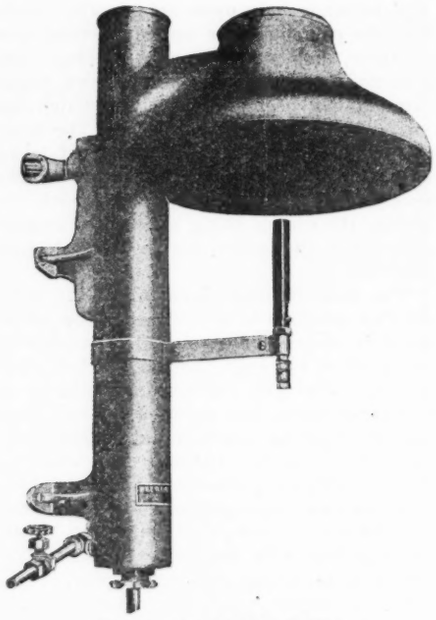
# Service Equipment
## Time Savers of the Shop



*Cincinnati portable electric drill*



*Jackson electric valve grinder*



*Distiller for service stations*

**Distiller for Repairshop**

DISTILLED water for the garage, service station and battery repairshop at 1¾ cents a gallon is offered in the new distiller made by the Sparta Mfg. Co., South Bend, Ind. This device does not give filtered water or purified water but distilled water, which is free from the soluble substances so harmful to the battery. The advantage of this distiller is that there is no distilled water kept on hand and allowed to collect impurities. This is very often the case in the garage where the distilled water is kept in a bottle under the table and when wanted the cork is removed with a rusty screwdriver or a greasy wire, resulting in harmful action to the battery.

**Portable Electric Drill**

A portable electric drill which serves as a drill press is made by the Cincinnati Electrical Tool Co., Cincinnati, Ohio. The tool is well suited for the small shop without a large assortment of machinery. The drill and the stand are separate, allowing the drill to be used on work around the car or on the bench. But when a large piece is to be drilled, the material is placed on the stand and the drill adjusted to its position. This combination gives a screw feed drill press.

**Electric Valve Grinder**

The Jackson electric valve grinder, made by the Kalamazoo Railway Supply Co., Kalamazoo, Mich., is an oscillating grinder for valve fitting only. This grinder is for the shop doing a volume of repair business. It is claimed that in factory jobs 3000 valves can be ground a day. It can be equipped with special attachments so it can grind overhead valves.

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### LAW IN THE CASE

*(Concluded from page 27)*

The repairman is a wise man in his generation if he demands his pay for work done, before the machine is removed, unless, of course, he knows the customer to be gilt edge.

Most lien laws applicable to repairmen are statutory, or at least modified by statute, for there are some rights given under the common law; and the repairman who does not acquaint himself with the law in respect to his own state is certainly monkeying with a band saw.

An hour spent with a good lawyer at so much per, or a brief of the subject from a local attorney who will take the time to look up the matter, is a very good investment for the repairman and will repay him many times over if he stays in the game for any considerable length of time.

### FORD DISTRIBUTERS MEET

Louisville, Ky., March 14—Co-operative effort and exchange of experience and methods to improve service were the objects of a convention of Ford dealers in the territory under the supervision of the Louisville branch who gathered 150 strong from southern Indiana, central Kentucky, and southern Tennessee at the local plant this week. The convention continued all day and concluded with a banquet at Hotel Henry Watterson.

### FORD TRACTOR GROWING

Dearborn, March 14—Henry Ford & Son have begun the use of the new shops south of the tractor plant and within three months it is expected the production of the factory will be doubled. The new building, started for the production of small tanks on Government account, affords 121,600 sq. ft. of floor space, while a connecting building between it and the old plant gives 58,800 sq. ft. additional. The plant is producing 250 machines daily. Since the first tractor was produced 46,226 machines have been made.

### NEW MEYER CAR

*(Concluded from page 45)*

It is expected that within three months regular production on the ½-ton delivery truck will be under way. The trucks will use the patented wheel and transmission. Falls will make the six-cylinder engine, the rest of the truck being produced by the company.

The passenger car is purely a custom proposition. It will use the patented features mentioned. It has a folding seat continuous across the tonneau that will seat three, making the car an eight-passenger. The folding seat can be so arranged that those occupying it can face in either direction. The engine of the car is optional with the purchaser. He may have as many cylinders as there are made and any make of engine. The body design is worked out to meet the taste of the owner. Color schemes and interior finish are entirely optional. In truth, it might be said the entire car is optional, with the exception of the patented features. The price of the touring car is $6,500.

# The Accessory Corner

## New Fitments for the Car

### Intake Air Heater

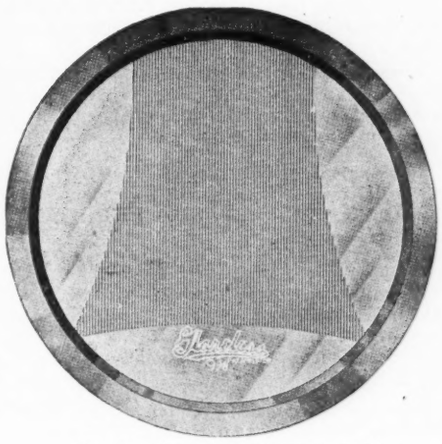
THE Twin Fire Spark Plug Co., Detroit, is putting on the market an intake air heater for Ford cars, selling for $1. This is in the form of a stove which bolts to the exhaust manifold and connects with a flexible tube to the carbureter air intake. Its work is to pre-heat the air and consists in the vaporization of its fuel during cold weather.

### Water Circulator for Fords

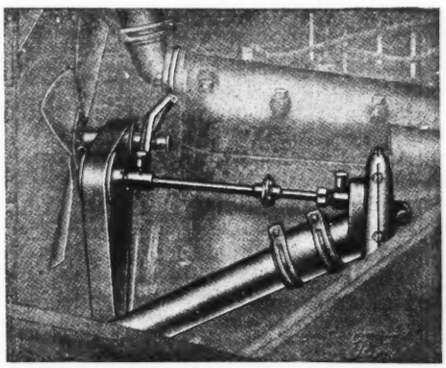
A centrifugal water circulator for Ford cars, made by the Economy Mfg. Sales Co., Chicago, is one of the new wrinkles to keep the water from boiling away. The pump is attached to the water inlet side of the engine, using the same hose, and is driven from the fan belt by allowing the belt to ride over the pump pulley, which serves as a sort of idler and means of keeping the belt tight. The pump is made in two different styles, cast iron copper finished and all brass cast. It comes complete, can be installed in a few minutes with the aid of a monkey wrench and sells for $10. The brass model is $2.50 more.

### Front Wheel Bearing

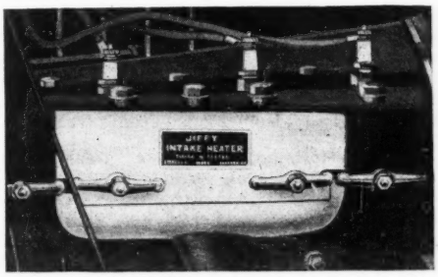
The George D. Bailey Co., Chicago, maker of the Bailey ball thrust, has placed on the market a front wheel bearing for Ford and Chevrolet 490's, under the name Shafer roller bearing, that eliminates the chief source of front wheel bearing trouble, namely, the inability to take a heavy thrust load without damage to the bearing and take care of axle spindle deflection as well. The outer surface of the inner cone is convex, having the contour of a perfect ball, and the rollers possess a concave surface, thereby forming a cradle for the cone and allowing it to swing to meet any deflection of the spindle when same gets out of alignment. The cone being free to move with the spindle and the load being taken upon the full length of the rollers causes no strain or binding of bearing itself as in the case of the rollers of a bearing the cone of which is held perfectly rigid and cannot meet the misalignment or deflection of spindle. The concave surface of the rollers at all times presents an equal load-carrying surface both from the side as well as the top and therefore the bearing is able to accept thrust loads equally as well as radial loads, it is claimed.



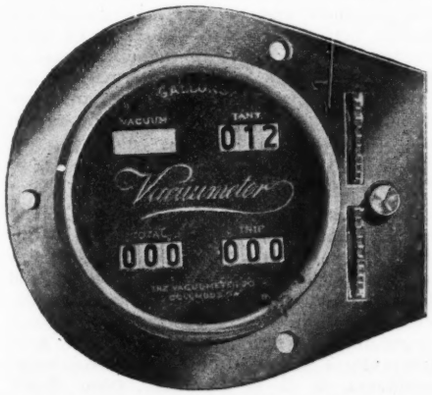
*Glareless lens which diffuses light*



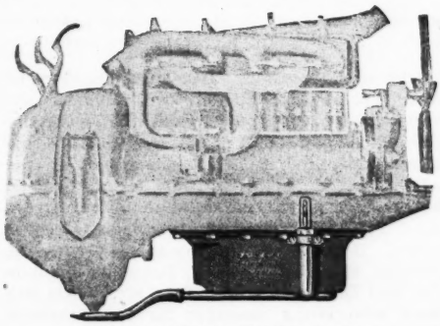
*Water circulator for Ford cars*




*Jiffy intake air heater*




*Vacuumeter for gasoline mileage*



*Sub-base oiler in Brown system*

### Glareless Lens

The Glareless Auto Lens Co., Chicago, claims to have developed a lens that will illuminate the road sufficiently to see a squirrel crossing the road 500 ft. ahead of the car and still not have any glare. The principle of diffraction seems to have been in the mind of the designer for that is what the lens embodies. Many parallel sharp cut grooves in the lens, at its center, spread the beam of light out, so it will illuminate the road at an angle of 45 deg. The diffusion so brought about does not divert the main beam of the light but is allowed to pass on, and its blinding, penetrating power is claimed to have been removed.

### Lubricating System for Fords

The Brown Co., Syracuse, N. Y., is manufacturing an oiling system for Fords that provides for complete circulation of the oil in the crankcase and transmission. The oil is caught and thrown outward in the Ford engine and is returned to the camshaft gears at the front of the engine. From there it flows to the troughs under the connecting rods, then back to the transmission housing, and again is sent on its journey. This is the ordinary Ford system, but when the Brown sub-base oiler is installed the oil is caught as it comes from the camshaft gears, flows to the troughs under the connecting rods. These troughs are insured of always being full, because the oil overflows and drips to the reservoir below, which has a sight gage on it to tell the quantity of oil in the engine. From the oil reservoir the oil flows through a pipe to the drain plug hole at the bottom of the flywheel casing. The price of the oiler complete is $6.

### Vacuumeter

The Vacuumeter Co., Columbus, Ga., is making a meter that tells to a tenth of a gallon how many miles are being obtained from the gasoline. The meter gives three readings. The first shows in gallons and tenths of a gallon the amount of fuel being consumed on a given trip; the second, the total number of gallons consumed; the third, in gallons and tenths of a gallon the quantity of fuel remaining in the tank. The window marked "Vacuum," by changing from white to red signifies that the entire vacuum system is in working order. The Vacuumeter is installed on the dashboard and can be applied only to those cars using the vacuum system. The instrument is connected to the vacuum tank by a copper pipe, which is included in the sale price of $15.

# Among the Makers and Dealers
## Short Trade Notes

**HARRISON Radiator Opens Detroit Office**—Sales, inspection and service departments of the Harrison Radiator Corp., Lockport, N. Y., have been opened in Detroit.

**Avery Promotes Yocum**—E. L. Yocum, formerly salesman for the Avery Co., Peoria, Ill., has been promoted to the position of manager of the Fargo, N. D., branch.

**Stutz Declares Regular Dividend**—The Stutz Motor Car Co. of America, Inc., has declared its regular quarterly dividend of $1.25, payable April 1 to stockholders of record March 22.

**Duplex Makes Caniff Superintendent**—C. O. Caniff, assistant to R. W. Langenbacher, sales manager of the Duplex Truck Co., Lansing, Mich., has been made superintendent of the eastern sales zone, with headquarters at Atlanta, Ga.

**Delco Light Prizewinners Meet**—About 800 Delco Light men, members of the sales organization of the Domestic Engineering Co., Dayton, Ohio, maker of the Delco Light, met in Dayton for the third annual convention. They were the prizewinners in various Delco selling contests held throughout the year.

**MacCoull Back from War**—Neil MacCoull has returned from duty in France with the Naval Air Forces, and is now connected with the Texas Co. as automotive engineer in the sales department, with headquarters in New York. Just prior to enlisting he was acting as a mechanical engineer in the machine works of the Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.

**Saxon to Occupy New Factory**—The concrete and steel plant built for the Saxon Motor Car Corp., soon will be ready for occupancy. When the new Saxon plant was near completion war started and the Government, looking for warehouses big enough to house its ordnance supplies, took over the new plant for the duration of hostilities. As the Government is now able to divert its war materials into civilian uses, the Saxon plant will be emptied now.

**Kesler to Manage Philadelphia Firm**—S. W. Kesler, formerly of New York, has been appointed manager for L. S. Bowers Co., Philadelphia, Pa., distributer of the Cole, Liberty and United States truck. Mr. Kesler until early last year was a captain in the aviation service, then he was in charge of camshaft production for a factory building Liberty engines. For four years he was manager of the Locomobile Co. in Brooklyn. He also was secretary of the Motor Club of Brooklyn and of the Brooklyn Dealers' Association. Subsequently he was in business for himself, handling Abbott cars, becoming factory sales manager.

**Hart-Parr Net Loss**—The annual report of the Hart-Parr Co. for 1918 show a net loss of $113,402. Comparison with previous years is difficult because of a change in fiscal year, but the business of the company during the year was surprisingly favorable and is not all reflected in the balance sheet. Current liabilities were but 58.8 per cent of current assets, as compared with 79.7 per cent in the previous year. There was a charge off of $993,937 for bills receivable, obsolete inventories and other possible losses. Real estate was charged off to the amount of $577,649. The company has claims of $120,000 against the Government for work done during the year.

**Russell Is Export Chief**—H. J. Russell has been made chief of the newly created Maxwell-Chalmers export department. He will leave for England in ten days.

**Detroit Has New Acessory Shop**—William J. Serlin, former manager of purchasing and advertising for the Bowman-Gould Co., accessory wholesalers, has gone into the auto accessory business for himself in Detroit.

**Alden Back with Timken**—Maj. H. W. Alden has received his discharge from the Army and has returned to Detroit. He is vice-president of the Timken-Detroit Axle Co. and will be active as consulting engineer.

**McBride Now with Premier**—Capt. V. K. McBride, Ordnance Department, who was located at Jackson during the war and transferred to Detroit after the armistice, has been made assistant to E. W. Hurd, sales manager of the Premier Motor Corp., Indianapolis.

**Superb to Make Trailers**—In addition to its regular line of parts and accessories the Superb Mfg. Co. will bring out a line of light and heavy trailers within the next sixty days. To have sufficient production facilities it is adding 20,000 sq. ft. of floor space to its present plant.

**Linerd Again Heads Globe**—Joseph B. Linerd was re-elected president of the Globe Rubber Tire Mfg. Co. for a second term at the annual meeting. Before his connection with the Globe organization he was with the Goodyear Tire & Rubber Co. and was later sales manager of the Ajax Rubber Co.

**Changes in Carlisle Tire Force**—A new central manager and treasurer have been added to the Carlisle Cord Tire Co. organization. A. G. Langher, formerly manager of the Diamond Rubber Co., and connected with it for the last ten years, has been appointed to the same position with the Carlisle Cord Tire Co., Andover, Mass., with headquarters at Chicago. L. H. Homer has become treasurer.

**Weekes-Hoffman to Make Gears**—The Weekes-Hoffman Co., Syracuse, N. Y., has completed plans to enter the gear manufacturing industry. It shortly will be turning out gears for cars and tractors in quantities which will necessitate the employment of 250 men. W. H. Diefendorf has severed his connection as chief engineer and a director of the New Process Gear Corp. to join the Weekes-Hoffman Co. as vice-president and general manager. J. M. Weekes is president and A. J. Hoffman, secretary and treasurer.

**Distribution, Sales and Advertising**—The Mead-Davis Co., Chicago, will include factory products distribution, sales and advertising. F. L. Mead will be in charge of the sale department and B. E. Davis, head of the advertising department. Mr. Mead resigned his position as generel manager of the Dearborn Truck Co. where he has been for three years. He has also been connected with the General Motors Truck Co., Buick Automobile Co. and Oakland Motors Co. Mr. Davis has been advertising manager for the Dearborn Truck Co. for the last two years. The new company plans to act as director of advertising and sales for manufacturers.

**Overland Employes Service Men**—Six hundred and fifty soldiers and sailors released from military service have returned to their old positions in the Willys-Overland factory.

**Keown Heads Louisville Branch**—John S. Keown, formerly in charge of the Ford Motor Co. branch at Albany, N. Y., is the new manager of the Louisville, Ky., assembly plant of the Ford Motor Co.

**Cressey with Cole Battery**—T. A. Cressey has been appointed sales manager of the Cole Storage Battery Co., Chicago. For the last three years he has been district sales manager of the Philadelphia Storage Battery Co. and for several years previous was sales engineer of the Electric Storage Battery Co.

**Rubber Products to Enlarge Plant**—The Rubber Products Co., Barberton, Ohio, will enlarge the present plant. A two-story wing will be built to be used for shipping rooms and storage purposes. The present shipping rooms and storage space will be converted into tire factory space. Tire making and vulcanizing machinery will be installed. This will bring daily tire capacity up to 500 sets. Another building will be built also.

**Stinson Gets Order for 300**—The tractor plant established recently at Superior, Wis., by the Stinson Tractor Co., Minneapolis, Minn., will undertake an order for 300 machines placed during the Minneapolis show by Martin & Phillips, Medicine Hat, Canada. Delivery is to be made at the rate of fifty per month, commencing April 1. The initial capacity of the Superior works was one machine a day, which is being more than doubled.

**Livingston with Connecticut**—Stanley D. Livingston, who was in charge of the apparatus design and drafting section of the Signal Corps Radio Laboratory, Camp Albert Vail, N. J., until his release from the Army, has been appointed designing engineer for the Connecticut Telephone & Electric Co., Meriden. He was for a time with the New York Edison Co. and was assistant chief engineer of Disco, which latter position he resigned to become engineer in charge of the electrical installation at Camp Merritt, New Jersey.

**Salesmen Inspect Service Station**—Cleveland was visited recently by 124 solid tire salesmen of the B. F. Goodrich Rubber Co. to attend a demonstration by Henry Schaefer, vice-president and general manager of the Gustav Schaefer Wagon Co. Hailing from practically every state in the union east of the Rocky Mountains, the Goodrich men arrived on a special train from Akron and were taken to the plant, which is one of the largest truck tire service stations in Ohio. The tire men came to Cleveland after a week's conference in Akron.

**Makers and Dealers Get Together**—A partial reorganization of the Cleveland Automobile Manufacturers' and Dealers' Association was effected at its annual meeting, and plans were set under way for extending the activities of the show organization. The following officers were elected: President, R. J. Schmunk, Peerless Motor Car Co.; vice-presidents, G. G. G. Peckham, Ohio Buick Co., and F. E. Stuyvesant, F. E. Stuyvesant

Motor Co.; secretary, M. L. Bridgman, Ohio Nash Co., and treasurer, M. B. McLaughlin, White Co.

**Duffield Essenkay Sales Director**—J. E. Duffield, formerly of the Bailey Differential Co., Chicago, has joined the Essenkay Products Co. as director of sales.

**R. L. Frost with Parrett**—R. L. Frost has been appointed production manager of the Parrett Tractor Co., Chicago. Mr. Frost formerly was with the Ford Motor Co., with direct supervision over the assembling plant.

**Overland Dividends Declared**—Willys-Overland, Toledo, Ohio, has declared a regular quarterly dividend on preferred of $1.75 a share, payable April 1 to stockholders of record March 20.

**Firestone Declares Quarterly Dividend**—The Firestone Tire & Rubber Co., Akron, Ohio, has declared a quarterly dividend on common of $1.50 a share, payable March 20 to stockholders of record March 10.

**Wilson Heads Philadelphia Buick**—E. B. Wilson, formerly in charge of the Memphis, Tenn., and Chicago branches of the Buick Motor Co., has been appointed manager of the Philadelphia branch.

**Thompson Assistant Service Manager**—Loyal E. Thompson has been appointed assistant manager of the service department of the Republic Motor Truck Co., Inc., Alma, Mich. He was formerly connected with the service department of the Cadillac Motor Car Co.

**Unbehaun with Black and Decker**—Charles W. Unbehaun has joined the sales force of the Black & Decker Mfg. Co., Baltimore, Md. He will represent the company in eastern New York and Connecticut, handling the company's line of portable drills, valve grinders and air compressors. Mr. Unbehaun was formerly with the Bailey Drake Co., Chicago.

**Changes in Motors Acceptance Corp.**—The General Motors Acceptance Corp., New York, has appointed R. S. Elliot, former sales manager for the San Francisco Chalmers distributer, district field manager. Mr. Elliot directed special work for the Pyrene Mfg. Co. during the war. A. L. Dean has been appointed manager of the Pacific coast territory.

**To Handle Marvel in Flint**—Rumer and Crossley, Flint, Mich., have organized to take over the sale of the Marvel carbureter and the Philadelphia Diamond Grid storage battery. J. C. Rumer for eight years was connected with Cummings Brothers, Flint accessory dealers, while J. B. Crossley was formerly service manager for the Flint branch of Chevrolet.

**Wheel Maker to Increase Output**—The National Auto Wheels Corp., Wausau, Wis., manufacturer of a patented resilient artillery wheel using solid tires, will enlarge its plant and add facilities for making virtually every part entering into the construction of the wheel. The company has a capital stock of $150,000. John R. Mentzer is general manager.

**Jones Gear Plans Expansion**—The Jones Gear Co., recently organized with a capitalization of $800,000 at Cleveland, Ohio, has purchased an 11-acre site for a new plant in which to manufacture transmissions, differential gears, clutches and cut gears. Officers of the new company are: President, Frank Jones, former chief engineer of the Warner Gear Co. and Muncie Gear Works; vice-president, R. L. Queisser; treasurer, A. R. Callow.

**Henderson Investigates Sales Prospects**—R. P. Henderson, general sales manager of the Parry Mfg. Co., Indianapolis, Ind., is on a six-week trip to the Pacific Coast, visiting the larger cities and conferring with Parry distributors. Parry production of truck bodies since Jan. 1 shows a great increase. January production figures were almost 90 per cent greater than December, and figures for February showed a gain of nearly 50 per cent over January.

**Bornstein Returns from Service**—Lieut. Harold D. Bornstein has returned from active overseas duty and has been appointed sales manager of the Cadillac Automobile Co., Boston, Mass.

**J. F. Mackin Joins Black & Decker**—J. F. Mackin, formerly with the Independent Pneumatic Tool Co., Chicago, has been appointed sales representative in Ohio for the Black & Decker Mfg. Co.

**Am-pe-co Has New Factory**—The American Machine Products Co., Marshalltown, Iowa, has moved into its new three-story factory, which gives it greatly increased facilities for manufacturing pistons.

**Tractor Dealer Holds School**—The Wisconsin Tractor Sales Co., Oshkosh, Wis., held a two weeks' tractor school recently. Prospective owners and about thirty dealers were present. A. D. Paine, manager of the company, was assisted in his talks by A. E. Lohman, district representative of the La Crosse Tractor Co., La Crosse, Wis. During the course a dinner was held for seventy-five of the La Crosse tractor sales force and service representatives.

**Buda Representative to Europe**—Conroy Fiero, formerly Washington representative for the Buda Co., Harvey, Ill., has left for Europe, where he will study the market conditions for the Buda engine.

**General Tire Opens Branch**—The General Tire & Rubber Co., Akron, Ohio, has opened a factory branch at Dallas, Tex., from which Texas will be served. Thomas L. Moore, southwestern district manager, is in charge of this branch.

**A. K. Carlson Returns to Commonwealth**—Amel K. Carlson has finished his work with the purchasing staff of the Wright-Martin Aircraft Corp., New Brunswick, N. J., and has returned to the Commonwealth Motors Co., Chicago, as assistant general manager.

**New Distributers of Turner Tractor**—G. W. Cherry, Denver, Col., has been appointed distributer for the Turner Simplicity tractor in Colorado. The George F. Smith Co., St. Louis, Mo., has been appointed distributer in southern Illinois and eastern Missouri.

# Dealers Gather to Get Plant Spirit

One of the three groups of Briscoé dealers that visited plant

Jackson, Mich., March 14—A dealers' convention, which in some respects was very unusual, was held at the Briscoe factory here last week. The Herff Motor Corp., Memphis, Tenn., is the Briscoe distributer in five southern states. Herbert Herff, president of the corporation, conceived the idea that the dealers throughout his territory would be able to sell cars more intelligently and with much more enthusiasm if they had a first-hand acquaintance with the company, its facilities and its product. He believed also the direct benefit would greatly outweigh the expense involved.

An excursion to the Briscoe plant, with the dealers as guests of the Herff Motor Corp., was arranged. Although it was necessary to act very quickly to realize the benefits of the trip in time for the spring selling season, 150 dealers from Louisiana, Arkansas, Alabama, Mississippi and Tennessee were included.

They were brought to Jackson in three separate parties two days apart—the idea being to limit the members of each party to give each man the benefit of personal attention during his stay.

One evening of each party was devoted to a get-together dinner. Frederick Cowin, president of Briscoe, and J. R. Findlater, vice-president and general sales manager, delivered a series of talks on Briscoe service, plans and prospects. Other members of the Briscoe organization spoke on merchandising and advertising co-operation.

This is one of the groups of dealers from a distance.

# From the Four Winds

## Glimpses at the World of Motordom

This photograph was taken at the officers' motor transport school in France and shows men and trucks lined up for inspection

**More Motor Buses for Detroit**—The Michigan Motor Bus. Co. has been organized by Minneapolis men and will soon operate twelve large buses in the downtown district of Detroit. Louis A. Root and J. A. Reynolds are officials of the new concern.

**We'll Get Good Roads**—Some idea of the immense effort which must be put forth by this country to catch up with European nations in highway construction may be gathered from the fact that when Germany entered the war in 1914 Prussia alone had 75,000 miles of hard-surfaced highways. To be equally well provided in proportion to the size of the two countries, the United States would need to have 1,611,914 miles of hard-surfaced roads. The present road mileage in the United States is 2,500,000, of which but 12 per cent is improved and but ¼ per cent constructed for heavy traffic.

**British Columbia Drives to Left**—British Columbia's legislature has voted to change an old rule of the road and make vehicles drive on the right side instead of on the left as they do here at present. This conforms with the custom in Great Britain.

**Money Spent for U. S. Roads**—Government road officials estimate that road construction and maintenance in the United States involve an annual outlay of over $300,000,000, a sum which, if capitalized at 5 per cent, would represent an investment of $6,000,000,000. There has never been a nation-wide traffic census to show either the direction or volume of traffic over these highways.

**County to Work on Roads**—Twenty-one counties in Indiana expect to spend more than $100,000 each on road and street work this year. Among the larger reports are: Lake county, $1,885,000; Laporte, $726,000; Marion, $591,000, and Randolph, $436,417.

**City Auctions Off Used Cars**—And now comes the motor car public auction. Cadillac, Mich., attended its first of such sales recently at the McDonald garage and service station, where sixteen used cars were placed on the block and sold at good prices in less than 2 hr.

**Buses Net City $12,000**—Akron, Ohio, collected $26,323 last year from licenses issued, the department collecting from all sources a total of $28,142. The highest number of licenses issued to any one line of business was for buses and taxicabs, the number reaching 587. The amount paid by them was $12,870.

**What Good Roads Lose for Us**—The congressional report of 1914 placed the economic loss to the United States through poor roads at an annual figure of $504,000,000 for transportation costs alone. The heavy increase in tonnage since that time probably makes the loss to-day close to $1,000,000,000 a year.

**Weak Bridges Near Weak Links**—The limiting factor in a great many roads extensively used has been antique bridges built in the days when light buggy traffic was the rule. Gradually the state departments are overcoming this handicap to travel by replacing these structures by solid, concrete spans. In 1917, $47,290,796 was expended in this way in the United States.

**Oregon Prepares for Tourists**—Because they wish to capitalize the tourist travel, the citizens of Klamath County, Oregon, are ready to raise $1,000,000 to build a road from the California state line to Crater lake. The success of the enterprise depends on both the county and the Government. The Government has agreed to pave around the lake, and as the proposed road runs up the forest reserve within which the lake is located it is possible the Government can be induced to build the road through the forest reserve.

**Iowa Wants More Roads**—Three new cross-state road organizations were formed during the Des Moines show, when representatives of seventy-five Iowa towns met at the instance of the Motor Trades Bureau of the chamber of commerce. R. H. Smith, Montezuma, was made chairman of the Diamond Trail Association, which will foster a road from Stanwood to Logan, passing through Iowa City, Des Moines, Panora, Guthrie Center and Harlan, with its marking a black diamond on a yellow field. The Iowa Park highway will go from McGregor through Elkader, Waterloo, Marshalltown, Newton, Des Moines, Panora, Guthrie Center, Carroll, Storm Lake, Spencer and Spirit Lake. Senator John W. Foster of Guthrie Center is chairman. The Everett Powers highway, named after an Iowa boy killed in France, is planned as a national highway from the Gulf of Mexico to St. Paul. The officers of the organization are: President, Henry Slack of Knoxville; vice-presidents, L. V. Russell, Adel, and W. J. Gochee, Oskaloosa, and secretary-treasurer, H. C. Carr, Des Moines.

## Coming Motor Events

### SHOWS

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| Boston, Mass. | Automobile Dealers' Association, cars | March 15-22 |
| Harrisburg, Pa. | Motor Dealers' Association | March 15-22 |
| Philadelphia, Pa. | Motor Truck Association, trucks | March 17-22 |
| St. Joseph, Mo. | Automobile Show Association | March 19-22 |
| Brooklyn, N. Y. | Motor Vehicle Dealers' Association, cars | March 22-29 |
| Warren, Pa. | Automobile Dealers' Association | March 22-29 |
| Trenton, N. J. | Auto Trade Association | March 22-29 |
| Pittsburgh, Pa. | Automobile Dealers' Association | March 22-29 |
| Utica, N. Y. | Motor Dealers' Association | March 24-29 |
| Clinton, Iowa | Automobile Dealers' Association | March 26-21 |
| Brooklyn, N. Y. | Motor Vehicle Dealers' Association, trucks | April 1-5 |
| Montreal, Canada | Soldiers' Wives' League | April 5-12 |
| Bridgeton, Conn. | Automobile Dealers' Association | April 5-12 |
| Deadwood, S. D. | Deadwood Business Club | April 8-12 |
| Bristol, Va. | | May 10-17 |

### MEETINGS

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| Chicago | National Petroleum Congress | March 25-28 |
| Hot Springs, Va. | Automotive Equipment Association | June 2-6 |

### RACES

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| Los Angeles, Cal. | March 23 |
| Indianapolis, Ind. | May 31 |
| Uniontown, Pa. | July 19 |
| New York | July 26 |
| Elgin, Ill. | Aug. 22-23 |
| New York | Aug. 23 |
| Uniontown, Pa. | Sept. 1 |
| New York | Sept. 20 |
| Cincinnati, Ohio | Oct. 1 |